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THE POSITION OF THE VETERINARY SURGEON IN THE CONTROL OF MILK, WITH SPECIAL REFERENCE TO COMMUNICABLE DISEASES*

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After due consideration of the subject entrusted to me I finally decided to deal in this paper primarily with those aspects of milk control with which I, as a veterinary surgeon, have come in contact. There are some items which I abbreviate or omit in the hope of covering them by showing lantern slides.

Bovine tuberculosis is the outstanding disease for which the cow is responsible and in which there is definite proof of its communicability to man. Contagious abortion is also of importance, and of its danger to man there is some evidence in the form of undulant fever. I propose to deal with these diseases first.

The milk producer who possesses a self-contained herd is in the fortunate position that the acquisition of a tubercle-free and abortion-free herd becomes a comparatively easy problem. Therefore it is worth while taking the necessary steps to possess a self-contained herd. There are some dairy farmers for whom it is extremely difficult or impossible to have self-contained herds, and one would not be foolish enough to advise them to make the attempt, but this fact should not be utilised as an argument against self-contained herds, or to discourage the large number of those who have ample land and accommodation, and for whom it is comparatively easy to possess self-contained herds.

A self-contained herd may be defined as one that is maintained by the rearing of the heifer calves from selected cows of the herd, and which no animal is allowed to enter, save under exceptional circumstances and the strictest scrutiny, and then isolated for a period. The members of the herd are not allowed to come in contact with other animals, and a bull is kept for the purposes of the herd alone, the farm being well fenced to prevent cattle breaking in from adjacent farms and *vice versa*.

In the process of establishing a self-contained herd, it will be found necessary, in most cases, to purchase new animals, and some risks must be taken, but these can be reduced very considerably by adopting the proper course. Once the herd is established great care must be exercised in selecting outside animals, and dealing with them before they are allowed to mix with the herd.

In certain cases of absolute necessity, discriminate buying of animals, yearling heifers or even younger ones may be a successful modification of the strictly self-contained herd, provided these young animals are properly tested and isolated and no risks are taken in conveying infection.

The advantages to be gained from a self-contained herd, provided that it is tubercle-free, and abortion-free, are:—

(1) Complete freedom from the losses due to tuberculosis—losses that the farmer does not recognise.

(2) No losses from contagious abortion.

(3) The building up of a good-yielding herd becomes simpler following the removal of the obstacles of tuberculosis and abortion.

(4) The herd becomes more valuable and the heifer calves will command a higher price.

(5) If combined with the production of milk of a low bacterial content, an increased price is obtained for the milk.

In all that has been said and written about milk the outstanding problem is still the elimination of tubercle bacilli. If we could eliminate tuberculosis from cows, then the milk problem would be no problem, or should I say the control of milk would become very much easier. When we succeed in improving the milk supply by the elimination of tubercle bacilli then we shall have accomplished much. If the Veterinary Profession were given the complete control in the eradication of bovine tuberculosis far more headway would be made, to the great benefit of the human subject and of the agricultural community.

For years there has been much opposition to

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the eradication of bovine tuberculosis and many statements have been made and arguments put forward in support of this opposition which are more or less of an obstructive character. A shortage in the milk supply is one of these arguments, but even the most extreme advocate would not suggest the eradication of bovine tuberculosis in a short period, as it is fully recognised that preliminary steps, such as the formation of tubercle-free herds and tubercle-free areas, must be taken before we begin the complete eradication. I would like to emphasise here that there is not enough work being done in these preliminary steps and that, at the rate we are progressing, it will be many years before the complete eradication of tuberculosis can be attempted.

I do not think it is the part or duty of the members of the Veterinary Profession to pay too much attention to the finance of the eradication of this disease. Their primary duty is to point out the necessity for it and the means by which it may be accomplished. I have no objection to studying the financial side of any proposal or scheme but we must remember that there are genuine and pseudo financiers and others who are doing, and will always do, their best in opposing schemes, irrespective of their merits, unless they are forced to give way by public opinion.

The theory that tuberculosis in cattle is responsible for an immunity in the human subject against human tuberculosis is used by some persons as an argument against steps being taken to eliminate tuberculosis from cattle. The views of these individuals have been accepted by the ignorant, believed by a few, adopted by some of those whom it suits, and used in some cases by the thoughtless and the unwary. It is definitely accepted that there is a considerable amount of tuberculosis in the human subject due to the bovine tubercle bacillus. This immunisation theory is supposition and is based on weak grounds. Immunisation must be on scientific and practical lines. I have thought fit to mention this question of immunity because I believe that it has been and is one of the great causes of the delay in more headway not being made in the eradication of this disease.

From observation I am satisfied that quite a number of owners who are attempting to build up tubercle-free herds do not clearly understand the steps to be taken, and enforced, to prevent the entrance of the disease. Where herds are free from tuberculosis there is great danger of introducing infection with a newly-purchased beast although this beast may have passed the tuberculin test. In cases where purchase becomes unavoidable, isolation should be insisted on for a period of six months, and then a re-test made before the animal is allowed to mix with the rest of the herd. In cases where the herd is established as self-contained and tubercle free, strict measures should be adopted, and no risks taken in the efforts to prevent the entrance of infection. Owners must be made to realise that tuberculosis is a highly infectious disease. It is not sufficient for the veterinary surgeon to know the infectious nature of tuberculosis if he cannot make the owner realise it too. The owner must take an active interest and co-operate or else there will be many failures and disappointments.

In the process of building up tubercle-free herds risks must be taken, but, if the advice of the veterinary surgeon is adhered to in detail, these risks are greatly minimised and many of the obstacles disappear. Perhaps the best example is that isolation and disinfection on the ordinary farms are *not* difficult problems in the hands of the veterinary surgeon.

The most common faults one finds on farms in the failure of proper methods to prevent infection, are contamination of feeding stuffs, the bad construction of feeding troughs, the neglect of proper cleansing of drinking bowls and feeding troughs, infection from swine, the mixing of the cows with other cattle on the lands, the grazing of cows on infected lands, and the failure to observe the necessity of good fencing between adjoining farms. I object to fowl having access to feeding material or land where cattle are grazed; fowl on a dairy farm must be confined to runs. I have not demonstrated avian tubercle bacilli in lesions taken from cattle, but there are some such cases on record; in any case, one must keep in mind that fowl may be responsible for some of the "no lesion reactors."

With regard to the possibility of human infection being responsible for reactors, one must recognise that this is a delicate subject, but if the ordinary precautions are taken with the proper sanitary arrangements there is little danger from this source on most farms. This question of human infection is of interest and worth future investigation in special cases, such as a herd attached to a sanatorium. I refer here to the possibility of not only the human bacillus being responsible for the "no lesion" reactors, but, in addition, the existence of bovine tuberculosis in individuals present as patients in the sanatorium.

One often finds ineffective procedure in the carrying out of disinfection after the discovery of reactors. It is not uncommon to see an abundance of disinfectant thrown around, without observing proper cleanliness. I have endeavoured to enforce the principle of cleanliness, such as the thorough washing and scrubbing of troughs, fittings, walls in front of cows and stalls, and when this is carried out then an effective disinfectant may be applied. I have

little faith in disinfection without this necessary cleansing.

When veterinary surgeons are consulted by dairy farmers as to the possibilities of building up tubercle-free herds, and the best method to be adopted, the advice given will depend to a great extent on the number of affected animals in the herd, facilities for isolation purposes, and the circumstances with regard to the grazing lands. If approached with the proper ideas, the establishment of a tubercle-free herd can be accomplished, provided that the dairy farmer has the necessary control over the farm and buildings. The first step is to have all the animals of the herd examined and those, if any, showing symptoms of tuberculosis should be eliminated, and the remainder subjected to the tuberculin test. If only a small number of animals react, these animals should be immediately removed from the herd. In cases where a fair number of cows react then it may be necessary to resort to the temporary isolation of these animals until it suits the owner to get rid of them. Where a large number of animals react, and unless the owner is in a big enough way of business to dispose of reactors in a short space of time, isolation over a long period cannot be avoided. A large number of reactors in a herd should not discourage the owners in taking steps in building up a tubercle-free herd. In the process it must be fully recognised that the animals are to be subjected to the tuberculin test every six months, and the feeding stuffs, including the grazing, protected and that, when reactors are found, the sheds must be thoroughly cleansed and disinfected.

The so-called tubercle-free herds which are being maintained by constant new purchases subject to the tuberculin test are of undoubted value as far as the production of tubercle-free milk is concerned, but the owners of such herds must look forward to a number of reacting cows on each six months test unless they are able to obtain the new purchases from tubercle-free herds or tubercle-free areas.

Contagious Abortion.—Contagious abortion is a serious disease, and I often wonder if the dairy farmer fully realises all the losses due to it. The control of this disease is becoming more important every day, due to increased dairy farming. In addition, in recent years this disease has received close attention from those interested in public health as a considerable number of persons are returned as suffering from undulant fever, the cause of which has been stated to be due to contagious abortion in cattle.

In herds where this disease is absent the owners should take the necessary precautions to prevent its entrance. The absence of the disease can only be determined by the examination of the blood of each animal of the herd by the agglutination test. In herds where only a small number, or even a fair number, of the samples of blood show positive reactions to the agglutination test, the disease can be eliminated by taking the proper steps. In herds where abortions are occurring, and there is an extensive infection, the disease cannot be readily eliminated within a short period, and other methods must be adopted, until such time as the owner is in a position to eradicate the disease.

The owner who wishes to establish an abortion-free herd must be made to understand that he should have the blood of each animal subjected to the agglutination test, and the procedure adopted should be under the guidance of his veterinary surgeon and should be in detail. The blood of some of the animals will require a second examination in from four to six weeks, such as animals which recently may have been exposed to infection, or in-calf cows, which will require re-testing a suitable time after calving. If there are only a few animals positive to the agglutination test the immediate disposal of these animals should take place. Where there is a larger number of positive animals there may be difficulties in immediate disposal, but in these cases the positive animals should be effectively isolated until their disposal is more suitable to the owner.

The best method of maintaining the herd is by adopting the self-contained herd system. Until the heifer calves grow up and come into milk, of course it is necessary to take in animals from outside sources, and this risk must be taken, but should be done with definite precautions.

As in the case of tuberculosis, proper disinfection is an important item.

I must be emphatic on the point that reliance must be put on the agglutination test rather than on the appearance and history of the animal, as the most common method of introducing the disease into a herd is through the newly-purchased cow. There has been adverse criticism of the agglutination test for contagious abortion, but I am not in agreement, as, by adopting the proper procedure, I have had excellent results following this test.

The following is the history of a herd, attached to a sanatorium, which is now self-contained, abortion-free and, with the exception of an occasional reactor, tubercle-free. The first six cows of this herd were purchased in the year 1926, and the herd now comprises 82 animals, including heifers, and rearing calves selected for the maintenance of the herd. The herd was self-contained in 1930 and was maintained by the heifer calves of the herd with the exception of four cows purchased at the one time in February, 1934. The cows are hand milked. (*See Tables next page.*)

Depreciation in Animals in 8½ Years from October, 1926, to end of April, 1935.

Reactors.	Doubtful Reactors.	Mastitis.	Defective Quarters.	Sterility.	Milk Records.	Bulls.	Reactors: Agglutination Test.	Other Causes.	Total.
18	7	14	4	9	9	3	1*	10	74

*On re-test 5 weeks after purchase in April, 1930.

(In recent years, there has been no loss due to doubtful reactors, but the losses due to mastitis and defective quarters are serious.)

Post-mortem Examinations held on 59 of the 74 Eliminated Animals.

Reactors.	*Post-mortem* Examinations.	Evidence of Tuberculosis Found.				No Lesions of Tuberculosis (Macroscopic)
		Mesenterics only.	Bronchial only.	Pharyngeal only.	Pseudo-Tuberculosis on Hock.	
18	17	7	1	1	1	7
Doubtful reactors 7	4	—	—	—	—	4
Remaining eliminated animals 49	38	—	—	—	—	38

With regard to other conditions stated to be occurring in man through milk and for which the cow is responsible, such conditions have not been reported in my area and I have not come in personal contact with them.

Mastitis is blamed for causing ill-effects in man. This disease gives a great deal of trouble on dairy farms and it should be dealt with as an infectious disease and strict measures adopted with infected animals. It is difficult to deal with, because in some cases the owner may not be aware of its presence and it is only too common to find noticeable cases dealt with in a perfunctory manner, and no real attempt made to control it. Individual cases of mastitis may be treated and the incidence of the disease lowered, but I do not think that we can claim that we are in a position to advise practical measures for its complete elimination. It is for this reason that I suggest that far more experimental work should be carried out under practical conditions. The milk from cows affected with mastitis is prevented from being mixed with the other milk of the herd by the attendant noticing the abnormality of the udder and by the use of the special cup used for the foremilk.

The contamination of the milk after it leaves the cow can be prevented by the production of "high-grade milk." In my view, the value of high-grade milk has not received its due recognition in, in addition to other things, the prevention of summer diarrhœa in children. In the inspection of a premises, the water supply and so on, perhaps the important thing is to see that measures are taken to prevent any possibility of contamination by the typhoid bacillus. The danger of diseased employees is, by reason of the modern methods adopted by the Medical Officer of Health, decreased to a minimum; at the same time, it is a danger which is common to high-grade milk, ordinary milk and pasteurised milk.

In the production of high-grade milk, methods and supervision mean *success* and their absence *failure*. I must emphasise the fact that some people have been led astray by reading, or listening to discussions, and have taken the extreme view that it is easy to produce high-grade milk on any old premises. With the exception of the production of small quantities, and where the owner is readily adaptable to an understanding of bacterial infection and contamination there must be suitable premises and the proper appliances. I have been in all types of dairy premises and it is my opinion that many of the middling and bad premises can be reconstructed so that milk of the highest grade can be produced on them. It is only some grave defect, such as the absence of a proper water supply, or impossible buildings, that would prevent a dairy premises from being suitably altered. With poor equipment and appliances, no matter how good the intentions, the different tasks would be too laborious and take up too much time. The necessary tasks must be made as easy as possible.

"High-grade Milk" may be defined as milk produced under good hygienic conditions from disease-free cows, cooled and bottled or put into suitable containers immediately after milking and delivered to the consumer as "raw" milk, having a low bacterial count: and the essentials in its production are worth considering.

(1) The water supply should be good and plentiful for the washing of utensils, cleaning of the buildings, and for the cows. It should be capable of cooling the milk in summer to 60°F. and although good results have been obtained from built, deep wells, the most suitable water for this purpose is from a deep boring, the water being pumped up to a tank of sufficient height over the farm buildings. The tank which holds the water must be kept in the shade and covered with some non-conducting material, to prevent the temperature of the water rising. The tank should be emptied and re-filled immediately before cooling of the milk as it is not unusual to find that the temperature of a water has risen in a storage tank and cannot carry out efficient cooling. Where there is a separate pump, the water may be pumped direct through the cooler, but in this case one must be careful to see that there is a suitable safety valve or the cooler may be damaged. A bad type, or a cooler unsuitable to the amount of milk to be cooled, will undo the good of a perfect water supply. In places where the water supply is scarce it should not be wasted; for example, water from the cooler should be utilised for washing the cowsheds and other buildings. Where at all possible, the water should be laid on to the different parts of the premises to facilitate labour.

To prevent contamination of the milk it is essential that the water supply be safe and no risks should be taken in this connection. The provision of a suitable and safe water supply is one of the most interesting things on a dairy farm and is a subject of its own. To be brief, where a public supply is not available, one must have recourse to a deep boring, deep wells, and springs or collection beds, the water from which must be filtered before use. Where the water obtained is not of a sufficiently low temperature to carry out the cooling of the milk, artificial means must be employed.

(2) The disposal of the drainage may be divided into two parts: (*a*) the liquid manure, (*b*) the water from the cooler and the washings from the dairy and cowsheds.

The drainage will depend upon the surroundings of the producer's premises to a great extent. There may be a public drainage scheme, the liquid manure may be saved and stored in tanks for use on the farm; in many cases the storage and carting of the liquid manure is not thought worth while and other methods are adopted such as disposal through ditches, filter tanks and in other ways. In all cases the disposal of a large amount of liquid matter must be arranged. In some places one finds carelessness with regard to this point, with the result that the grounds adjacent to the buildings show lodgments of an appreciable amount of liquid matter. A high bacterial count may not be the result of this carelessness, but the appearance of the place is bad and the labour of cleansing the dairy, cowsheds, and the cows which pass to and from the sheds is greatly increased.

(3) The interior of the buildings should be so constructed that they may be easily cleansed and kept clean so that labour may be decreased to a minimum. With regard to the cowsheds, I refer particularly to all parts of the floor, including cow beds, troughs, fittings and walls up to five or six feet. The construction of the flooring space is very important and requires great attention. In the construction of drainage channels be careful to have them simple and free from fittings or coverings which are difficult to clean or keep clean.

Experimental work in the construction of cow beds would be much appreciated. Concrete is, I suppose, the most economical material for the purpose. It is non-absorbent, is easy to clean and keep clean, but it is not good for the cows, and I wish that we could improve on it.

The proper cleansing of all parts of the cowshed is of outstanding importance, not only in the interests of the production of clean milk but also in the prevention or elimination of the main diseases which cause great losses to milk producers.

A high-pressure pump is now utilised in keeping clean our abattoirs and some of our factories, places which, prior to its advent, were very difficult or impossible to keep in a proper state of cleanliness. I know of a high-pressure pump which is giving satisfactory results on a dairy farm, and in my opinion they should be more generally used, even where electricity is not available.

(4) Sufficiency of natural and artificial light is essential in several respects, and one cannot hope, without them, to be successful in the production of high-grade milk. The dairy must be kept as cool as possible, therefore the position of the windows or openings is of moment, to prevent the damage that might be caused by sunlight. On the other hand, it is important to get as much sunlight as possible into the cowshed. In districts where children play adjacent to dairy premises, roof lighting is not favoured, in consequence of the heavy breakages. In providing artificial lighting electricity is a priceless asset. I have seen generating plants installed with success and some of them at a comparatively small cost.

(5) The ventilation and cubic space is of

importance and I have found that the cows in existing sheds will, without any undue ill-effects, stand with comfort increased ventilation, but the complaints, when made, are from or on behalf of the attendants. I would like to stress this point, that in the reconstruction of old cowsheds the real difficulty is *not* with the cows but with the men.

(6) All the appliances and utensils with which the milk comes in contact must be washed, rinsed and sterilised twice a day. It is important that the sterilisation chest is of the right capacity to suit the boiler. It is also important—I say, of extreme importance—that the chest be provided with a suitable thermometer, so that all the utensils and appliances be subjected to 212°F. for ten minutes. A practice is being developed of carrying out the sterilisation at a lower temperature but for a much longer period. This practice is worth investigation, as it has advantages and may be easier on the attendants. I have great sympathy with the producer of high-grade milk in his ceaseless attention to supervision, and any suitable measure to make things easier for him is worth adoption. I believe that the installation of a special type of thermometer, which registers the temperature, its height and duration, and which is not under the control of the attendant carrying out the sterilisation is of great benefit. The rubber parts of milking machines should be separated from their metal connections and after thorough washing, put in muslin bags, sterilised in the sterilising chest, or boiled in water.

The efficient washing and sterilisation depends to a great extent upon the type and condition of the utensils; for example, it is difficult to cleanse and sterilise a "made up" covered pail and other articles which have been constructed with, or repaired by, bad soldering methods; in other words, beware of soldering. On this account, and in other respects, great care should be taken in the selection of utensils.

(7) The methods of milking are of great interest to me and I must say that I lean towards the milking of the cows by machinery in a special shed used only for that purpose. The different methods carried on at present are hand milking, machine milking, and the milking in a compartment attached to the dairy and in which the milk is taken by suction from the cow over the cooler and into the bottle. Where attention is paid to details, good results will be obtained by the three systems.

Hand milking must be "dry" milking and special measures of cleanliness adopted by the milkers and the milk taken into properly covered pails.

Machine milking requires special attention to details such as the washing and sterilisation of all the parts with which the milk comes in contact; and, in addition, of the rubber tubes which come from the pipelines to the milk units. From a bacteriological point of view do not rely on the valve above the milk unit. In short, everything down from the pipeline, with the exception of the pulsator, must be washed and sterilised twice every day. The pipeline must be securely installed with suitable falls to the drain taps, and these pipelines should be washed out regularly and drained immediately before and after milking. I must emphasise that carelessness in the installation of these pipelines may lead to trouble which may be difficult to locate. The attendant must pay proper attention to the cows during the process of milking, and it is especially necessary that the attendant be present with the cow before the machine is ready to come off. The removal of all straw from, and the thorough cleansing of, the cowsheds must be carried out before milking. It must be realised that milking machines have given good results and have many advantages, but one cannot expect them to be successful unless the proper care is taken of them. Carelessness and bad methods in the use of a milking machine will be followed by bad results, and it is a pity to blame the milking machine.

The value of milking machines from a public health point of view is lessened by the habit of "stripping." I believe that "stripping" can be eliminated, but I have not much support in making this statement, because it is difficult to get producers, or a sufficient number of them, to carry out the necessary experimental work. I have been told that the elimination of "stripping" may be followed by many things, such as mastitis, low yield, poor milk, cows going dry, and not reaching the normal lactation period. Is anyone in a position to say that these faults are absent from hand-milked herds? On the contrary, we know they are *common* in hand-milked herds. A bad hand milker, and there are many of them, can do the harm attributed to milking machines. If the attendant is with the cow before the milking machine is ready to come off, and handles each quarter of the udder in a gentle way, it will be found that there is little necessity for "stripping." If the labour put into "stripping" were applied to the machine at the proper time, I believe that this process would be found to be unnecessary. There are some cows that will not give all the milk through the milking machine, but why should these few cows be utilised as an argument against the elimination of "stripping"? I say, *get rid* of these few cows.

Although I have said that I have very little support on this question of the elimination of "stripping," still it is worth mentioning that an experiment was carried on, covering a period

of nine months, to my personal knowledge, and "stripping" was eliminated, with good results. In addition, a farmer who has used milking machines for 20 years, informs me he does not "strip." I am definitely of the opinion that experiments should be carried out under practical conditions, and under the proper supervision and with unbiased ideas.

In my opinion, the machine milking of cows in the special compartment attached to the dairy gets rid of many of the difficulties encountered in the change over to the production of a high-grade milk. From my observation it is easy, with the proper handling, to train the ordinary cow and it is a noticeable fact that she will not pass manure in the special milking shed. It is important in the installation of this system that the milk pipes be in sections, so as to facilitate easy washing and sterilisation. Here again the elimination of "stripping" is important from a public health point of view. This system has many advantages, which I hope to demonstrate by lantern slides.

Clean cows are essential and if they are housed under reasonable conditions and the hair on the udders and surrounding parts and on the tail is kept clipped short, the operation of cleaning is much simplified. I do not like washing the cows from buckets, even the special bucket, due to the difficulty of getting the attendants to change the water. It is a fact that a cow will look clean after being washed with dirty water, but pass a sample of milk, immediately after milking, through the "minit" tester and it will soon reveal the fact that dirty water has been used. I much prefer a water pipe run behind the cows with water taps at intervals, on which a short length of hose-pipe is connected; in this way each cow is washed with perfectly clean water instead of the water from the bucket. The cost of the installation of this water pipe will be saved in a short time on account of decreased labour. The washing of cows has become quite common and producers adopt different methods; I do not want to criticise these methods if it be realised that the cows' udders and surrounding parts must be clean and dry, with just the slightest trace of moisture to allow of dry-milking.

Bacterial counts are of great help in the control of milk but they cannot replace inspection at the source. The installation of an efficient cooling system and efficient sterilisation can cover up dirty methods. We must guard against the cooling of milk and the sterilisation of the utensils being used solely on economic grounds and the public health aspect of production forgotten. The standard of bacterial counts should be much stricter in the winter than during the summer months.

Conditions for the Supply of Milk to the Infant Aid Society of Dublin for Twelve Months to March 31st, 1936

1.–6. Deal with the ownership of the herds, the tuberculin testing of the cows every six months, the removal of reactors and the isolation of animals showing evidence of disease, the entrance of new cows to the herds, the identification of cows and the keeping of herd books by the contractors.

7. The milk shall be produced and handled in the cleanest and most hygienic manner, cooled and bottled immediately after milking. All milk utensils, appliances, containers, bottles, coolers, etc., to be thoroughly cleansed, rinsed and sterilised by steam before use. The cows, byres, and premises shall be subject to inspection by the Chief Veterinary Inspector of the Public Health Department, Corporation of Dublin. The cleanliness of cows and premises and handling of milk must be to his satisfaction.

8. During the months of April, May, June, July, August, September and October, the milk shall not at any time contain more than 100,000 organisms per c.c. or any coliform organisms in the 0·01 c.c. If the bacteriological report on a sample of milk taken by the Infant Aid Society states that more than 100,000 organisms are present, the following deductions will be made from the contract price of the milk supplied on the day on which the sample was taken:—

If more than 100,000 but less than 200,000, 1d. per gallon.

If more than 200,000 but less than 400,000, 6d. per gallon.

If more than 400,000, 1s. per gallon.

In addition to above amounts:—

If coliform organisms are present in 0·01 c.c., 2d. per gallon.

During the months of November, December, January, February and March the milk shall not at any time contain more than 50,000 organisms per c.c. or any coliform organisms in 0·1 c.c. If the bacteriological report on a sample of milk taken by the Infant Aid Society states that more than 50,000 organisms are present, the following deductions will be made from the contract price of the milk supplied on the day on which the sample was taken:—

If more than 50,000 but less than 100,000, 1d. per gallon.

If more than 100,000 but less than 200,000, 6d. per gallon.

If more than 200,000, 1s. per gallon.

In addition to above amounts:—

If coliform organisms are present in 0·1 c.c., 1d. per gallon.

If more coliform organisms are present in 0·01 c.c., 2d. per gallon.

9.
10. } Deal with the delivery of the milk once daily in bottles with suitable caps.
11.

12. On failure to comply with any of the above conditions or on receiving an adverse report as to the production and handling of the milk, irrespective of the results of the bacteriological examinations, the Infant Aid Society reserve the right to terminate the contract.

There are approximately 6,800 pint bottles of this milk delivered daily to the depôts of the Society.

It should be noted that there must be good hygienic conditions on the farms, irrespective of the bacterial counts, and the standard for bacterial counts is higher in the winter than during the summer months.

Other Milk.—I am afraid that I have dwelt too long on the supervision of the production of high-grade milk and that there is little space left for ordinary milk and pasteurised milk.

In the supervision of the production of ordinary milk one must aim at the highest possible standard and my foregoing remarks apply to this class of milk, of course with modifications. With regard to the inspection of the cows, the following procedure has been tried, and has given good results. I do not suggest that this procedure is suitable for adoption in all areas, but I submit that by adaption it may be utilised. On the examination of the dairy cows, each suspect cow is given a reference number; where a cow is found to be affected with any disease or condition, other than tuberculosis, likely to infect milk, a notice is served interdicting the sale of the milk. Where a cow is found to be suffering from tuberculosis as specified in the Bovine Tuberculosis Order, she is slaughtered with all possible speed. The methods employed for the detection of tuberculosis are, the microscopic and biological examinations of the milk, microscopic examination of the sputum and the tuberculin test. With regard to abnormal udders, samples of milk are taken and in cases where tuberculosis is suspected a microscopic examination is made for tubercle bacilli. If the microscopic examination be negative, the sample is submitted to biological examination. In all other cases of abnormal udders, where the cause of the condition is not definitely known, samples of milk are grouped in, say, seven to ten samples in a group and the group sample submitted to biological examination. These measures have been adopted to ensure that all cows with tuberculous udders shall be detected. When a group sample is negative one is greatly relieved; on the other hand, when the group sample proves positive one must concentrate on the offending cow or cows in the group. This is done by an immediate re-examination of the cows of the group and in many cases the condition of the udder has developed to such an extent that tubercle bacilli can be revealed on microscopic examination; if not, recourse must be had to individual samples for biological examination or the tuberculin testing of the cows in the group to eliminate the animals *not* affected with tuberculosis, then proceeding with the biological examination of the remainder. On a basis that one in three animals will react to the tuberculin test I am in favour of the application of the test to eliminate the unaffected animals. I have found that the tuberculin test is a very great help in eliminating non-tuberculous animals. I would like to make it clear that I am not suggesting that the biological test should replace the microscopic examination, but that it should be utilised so as to ensure that all cases of tuberculosis of the udder shall be detected. After 22 years' experience of the microscopical examination of milk I have found that, where samples are taken under proper conditions, there is no difficulty in distinguishing tubercle bacilli from other acid-fast bacilli.

One must recognise that pasteurised milk is bound to form a very large quantity of the milk supply in cities. From our present knowledge the holding process, under proper supervision, is a satisfactory method of pasteurisation. I must say that I am in favour of the development of the pasteurisation in bottle. There are many pasteurising plants which have been developed to a high degree of efficiency and it is only necessary that they be properly worked. On the other hand, there are other installations which, in practice, one could not support and which cannot be regarded as safe, especially where supervision and methods are inadequate. I have introduced the pasteurisation of milk in order that it may form part of the discussion.

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Mr. F. J. Daly (Swords), President of the Public Health Section, was in the chair at the well-attended session at which this paper was discussed, in the Physics Lecture Theatre, Queen's University, Belfast, on the morning of Tuesday, July 30th, 1935.

The Chairman said that in the Free State there was a Bill just passed dealing with milk; in Northern Ireland the Milk Bill had really been in operation only a few months, and he understood that in Scotland there was also a new Order being brought in dealing with milk. The subject under consideration seemed, therefore, to be a very important one and he anticipated a very interesting discussion on the paper.

He asked Mr. Dolan to make any remarks he desired in the way of amplification, and he understood he had some slides to show.

Mr. Dolan preceded the discussion on his paper by exhibiting a number of slides illustrative of various tuberculous conditions both in the live animal and *post-mortem*; also tables showing the incidence of bovine tuberculosis in the human subject; different types of cowshed; together with slides relative to the provision of a clean water supply for the dairy herd.

Discussion

Mr. J. N. Ritchie (Edinburgh) opened the discussion in the following terms:—

We have had an excellent paper presented by Mr. Dolan. I do not intend to follow it point by point, but rather to amplify and treat the subject generally.

The control of the milk supply from the point of view of diseases communicable to man consists chiefly in attention to two large issues; the assurance that the cow is producing milk free from infection with disease organisms, and that the milk, subsequent to its production, is not contaminated with such organisms.

The first point is obviously more important to the veterinary surgeon while the second interests him more indirectly.

From a study of legislation in force in England and Scotland we find that the sale of milk from cows suffering from certain diseases and disease conditions is prohibited, and in this list we find, as we might expect, the infections in cows which are most likely to be passed to the consumer. The specific diseases mentioned are certain forms of tuberculosis, anthrax, foot-and-mouth disease, acute mastitis and actinomycosis of the udder; other conditions include sores on the teats accompanied by suppuration and bleeding, any infection of the udder and teats which is likely to convey disease, suppuration of the udder, any comatose condition, any septic conditions of the uterus and any disease liable to infect or contaminate the milk. Some of the latter phrases lend themselves to a wide interpretation; for instance, any disease liable to infect or contaminate the milk might include infections with the typhoid-paratyphoid group of organisms and infection with the *Brucella abortus*.

Of the specific diseases mentioned the most important in connection with the control of the milk supply are tuberculosis and mastitis; and contagious bovine abortion may be added. It is less likely that anthrax and foot-and-mouth disease infections may reach the milk supply and in any case the orders, made under the Diseases of Animals Acts, dealing with these diseases are sufficient to safeguard the consumer. Actinomycosis of the udder is mentioned but it is an extremely rare condition and the possibility of infection to man is proportionately remote. Non-specific ailments such as metritis and retained fœtal membranes, suppurating conditions of the udder and teats, etc., may also infect the milk supply; such infection is certainly potentially dangerous but it is exceptional for it to give rise to any specific disease in man. Routine clinical inspections of cows have gone far to reduce infections such as those mentioned, for the educative influence which is brought to bear on the dairyman is gradually making him realise that milk from such cows (and cows suffering from mastitis) is potentially dangerous and may also prejudice the keeping qualities of the milk.

Tuberculosis: Mr. Dolan has, I think rightly, said that tuberculosis is the outstanding disease from which cows suffer and in which there is definite proof of its communicability to man. As such, then, this disease must figure largely in any discussion on the subject of Mr. Dolan's paper.

The veterinary profession does a great deal of work in reducing tuberculosis infection in milk. Routine inspection of dairy herds has, among others, this very definite object in view. There is no doubt that clinical inspection of cows, however carefully and efficiently carried out, will never give complete assurance that milk is free from infection, although many dangerously infected cows are slaughtered as a result. Clinical inspection combined with biological tests of bulk samples of milk is probably a little more efficient but still leaves the position far from safe. If I may give an instance I would quote a case in which a biological test of a bulk sample obtained on June 6th was reported positive on July 5th. A careful examination of the herd revealed no suspicious cow and as some of the herd had been disposed of, a control bulk sample was taken and it was reported positive on August 5th: again the herd was examined, but still no suspicious cow was found, and accordingly samples from groups of cows were submitted for biological test. One group sample was reported positive on September 3rd. This group of cows was examined and one was found which had a slight enlargement of one hind quarter unappreciable at the earlier examination, a sample from this quarter was examined microscopically, and while no acid-fast organisms could be found the examination seemed to justify the application of restrictions which had been placed on the use of the cow's milk. The biological test of her milk was reported positive on September 25th. The tuberculin test might have been applied but would only have been useful had all the other cows of the group failed to react. This is not a very exceptional case and shows the length of

time that may elapse from the time a bulk sample is shown to contain the organisms until clinical evidence is found in the udder; in this case that period was roughly three months.

From what I have said I do not mean to infer that routine clinical examinations or these combined with biological tests are useless, for I am sure that the removal of grossly infected cows is of great importance, and that the educative influence of visits by veterinary surgeons for routine clinical examinations has a most salutary effect. There is no doubt that the cow which is found and removed at routine inspection is contributing a far more dangerous infection than the one whose milk is infected but in which it is impossible to demonstrate the organism microscopically and which will require a period of time even up to eight weeks before diagnosis is completed by biological test; and there is a possibility that the removal of more and more clinically affected cows has had some effect in reducing the statistical incidence of bovine tuberculosis in man.

Mr. Dolan has dealt fully with the question of the establishment of tubercle-free herds. We have seen lately a great deal of writing in this connection and on occasions it has been said that the establishment of such herds is impracticable. If great care is not taken to observe certain very obvious rules in the management of such herds there is no doubt that they cannot be maintained in a tubercle-free state or if they are to be so maintained, the loss through reactors will be considerable. The practice of purchasing as replacements the non-reacting animals from among a random bunch tested could never be regarded as safe even if it were thought to be sane.

The purchased animal must itself be a non-reactor and if it has not come directly from a source which is above suspicion then it must be isolated before admission to the herd. I cannot, however, agree that the period of six months isolation which Mr. Dolan suggests is practicable in other than exceptional circumstances, but would rather adopt more frequent testing and reduce the period of isolation.

Another matter which would appear to have received too little attention by many owners of tubercle-free herds is the disinfection of floats and other vehicles used in the transport of purchased animals. It is difficult definitely to incriminate vehicles as a source of infection, but I am satisfied that they cannot be ignored.

Mastitis: A good deal has been said from time to time about the connection between septic sore throat in man and mastitis caused by hæmolytic streptococci—to which category, incidentally, *S. mastitidis* belongs. Such cases occur but it is difficult to find a case in which the connection between the two has been definitely established. In the investigation of outbreaks of scarlet fever where hæmolytic streptococci have been recovered from the throats of patients, milk is often blamed as being associated with the infection, and investigation at the dairy farm from which the suspected milk came may find dairy workers who have also infected throats. Samples of milk from individual cows may be found in which there are hæmolytic streptococci. Again, however, there is no clearly established connection between the cases, as the streptococci in scarlet fever cannot be said to be the cause of the disease and in many cases the organisms may have originated from the human source.

Abortion: The question of the connection between infection with *Br. abortus* of cattle and undulant fever in man has been a matter for debate for some time. There seems to be no doubt that infection in man does arise from milk but it is also true that the percentage of infection in milk is out of all proportion to the number of cases of undulant fever. I cannot explain why there is this apparent discrepancy: it does not seem to be enough to say that the adult is more susceptible to infection than the child, and that the adult does not drink enough milk to produce infection; but there may be some explanation in the suggestion that the organism, having become acclimatised to the bovine, is consequently less virulent for man. Whatever may be the explanation the fact remains that the number of recorded cases of undulant fever is not alarmingly high while the amount of infection in milk *is* alarmingly high as it shows the extent to which the dairy herds of the country are affected. There is an undoubted need for action to control contagious bovine abortion, but the veterinary profession must base its argument for action on the agricultural issue rather than on the public health one.

Outbreaks of food poisoning from milk are fortunately rare in this country. McAllan and Howie have shown that such may occur directly from infection in the cow's udder or by contamination from the fæces of cows suffering from diarrhœa due to organisms of the typhoid-paratyphoid group. Such organisms may also gain access to milk from human sources.

Many other disease outbreaks in man have been traced to milk, such as scarlet fever, typhoid fever, diphtheria and summer diarrhœa. Infection has been shown to gain access to the milk in the producers' premises, the distributors' and pasteurisers' premises, and in the home. The number of such outbreaks has not been large in recent years, and it is not strictly a veterinary problem to control them except under exceptional circumstances where, for instance, the organisms may have been passed to the cow's udder or teats, harboured and incubated there and transmitted to the milk.

In the prevention of such outbreaks of disease a good deal of risk would seem to be avoided if the milk is bottled on the farm.

Pasteurisation has long been discussed from the point of view of preventing infection to the consumer by organisms in milk. It has been said that efficient pasteurisation is the only means of safeguarding the consumer from milk which has been infected with tuberculosis. Such a statement admits of no denial. Unfortunately, however, its truth depends almost entirely on the qualification of "pasteurisation" by the word "efficient." The problem in obtaining efficiency is, that while a pasteurising plant may be capable of properly treating the milk to destroy the organisms, there is difficulty in evolving a sound method of controlling the management of the plant to ensure that it will always be efficient. The process should be used as a safeguard against tuberculosis and those infections which may gain access to the milk at any time subsequent to its collection, and not as a means of enabling the distributor to deliver an apparently sound supply of milk which if untreated would have been obviously unfit for consumption.

Dr. Charles S. Thomson, Medical Superintendent Officer of Health, Belfast, after expressing pleasure at being present, said he just wanted to fathom the veterinary position with regard to milk.

He was astonished to hear Mr. Ritchie say the veterinary profession must base its position on the agricultural position and not on that of public health. He was there as a Medical Officer of Health and he based his position on the public health point of view, and that being so he was driven, against his will, to believe in pasteurisation. He should think that 999 out of a thousand medical officers of health had been forced to believe in pasteurisation.

From his own experience of the milk supply in Belfast the samples injected into guinea-pigs showed about 4 per cent. of tuberculosis. In other places 7 per cent., 8 per cent., and 10 per cent. of samples had been found to contain tubercle bacilli.

The speaker next mentioned the question of the infection of milk with scarlet fever organisms and diphtheria and related an incident that occurred, he said, some four years ago, when they had in Belfast eleven or twelve cases of diphtheria in a certain road. The milk had come from a common producer. They visited the place and swabbed the throat of the boy who did the milking and he had the diphtheria germ in his throat.

They were driven for those reasons to believe in pasteurisation.

The speaker also referred to an outbreak of undulant fever in Belfast and said that he believed the parties concerned had taken a fair amount of milk.

"We are therefore driven," declared Dr. Thomson, "to insist on steps being taken to make the public milk supply safe."

Lieut.-Colonel J. A. Dixon (Leeds) thanked Mr. Dolan for so very ably bringing forward that subject of the milk supply, which he (the speaker) considered of the very greatest importance to the veterinary profession. He thought, in fact, that the question of the production—and, to a great extent, the distribution—of the public's milk supply was essentially a veterinary question and he never admitted that the veterinary point of view was exhausted by considering merely the health of the cow.

He was in agreement with Mr. Dolan's paper as a whole, but he would like to single out one point to which he would like to lend a considerable amount of support. His experience had been the same as Mr. Dolan's with the introduction of the up-to-date milking machines, and "stripping" was now being recognised as unnecessary. Some of their more progressive farmers in the area he had been concerned with for a number of years had adopted milking machines. Some of them had replaced them with something more efficient, and by the machine-milking process they got all the butter fat content. It was regarded as largely a matter of habit. When the cows had become accustomed to being milked by machinery they yielded their milk and "stripping" was unnecessary.

The farmers should be encouraged to adopt milking machines. He believed that with the more modern and greatly improved milking machine much had been done to improve the clean character of the milk supply, and with the more recent development of the auto-recorder and the direct pipeline for the conveyance of the milk from the cow's udder into the bottle a much greater advance might have been made in the production of clean milk.

While he was on his feet, continued the speaker, he was encouraged by the title of the paper to take that opportunity of urging upon veterinary surgeons a point of which he feared sight was being lost, in England, at any rate, and on which their domain and their practice were being seriously encroached, and that was that he claimed that the veterinary surgeon was the proper authority on the housing of dairy cows. He based that claim on the analogous position of the Medical Officer of Health. On the question of human habitation no question was ever raised that the Medical Officer of Health was the authority on the fitness of a house for human habitation and he (the speaker) claimed that they were in an exactly analogous position and that the veterinary surgeon should claim to be the authority on animal habitation. That point in England generally was being very rapidly lost.

At the recent Enquiry of the Committee on Cattle Diseases there was opposition to their claims by those who were very anxious to to encroach upon their province. They had made a claim, and got it admitted, that they were the authorities on animal habitation. He referred quite boldly, he said, to the sanitary inspectors. They had made that claim, and he regretted it had been omitted from the Gowland Hopkins Report, but he thought they had not lost entirely the opportunity and the time to overtake that mistake. In the new Milk Designations Order there appeared to be another opportunity. The introduction of the accredited milk producers' scheme and the tremendous increase in Grade "A" production licences appeared to have given to the sanitary inspectors opportunities, which they seized, of re-asserting themselves. It appeared to him that for some years they had felt that their dominant position had been lost by the appointment of County Veterinary Staffs and they immediately seized upon the Grade "A" production scheme

as a means of regaining some of their lost prestige, and it was up to them as veterinarians, not only whole time, but every veterinarian in the country, to preach and to teach at every opportunity that the sanitary inspector was not entitled to assume that position as regards animal habitation. That opportunity was presented to them by the Milk Designations Order, and he believed if they seized the opportunity they could re-enforce their position as the proper authority on the production and distribution of milk from the cow to the consumer, which was their entire province. (Applause.)

Mr. H. T. Matthews (Liverpool) said he had a great respect for Mr. Dolan. He could say with perfect sincerity he was one of the select few who had led them in public health. He suggested however, that Mr. Dolan had written an excellent paper the title of which should be "The Advantages of the Self-Contained Herd and the Production of High Grade Milk," but he had not written a paper covering the title, "The Position of the Veterinary Surgeon in the Control of Milk." He thought they ought to discuss that title. Of what Mr. Dolan had written he had little or no criticism. He certainly did not propose to offer any. He thought that they should widen the sphere of that discussion by discussing absolutely what was their position.

Colonel Dixon—who was a great fighter—had started them on one line. It would be a great delight, he thought, to the practitioners who were present to see one whole-time man venturing to disagree in public with another whole-time man.

He did not quite like Colonel Dixon's attitude with respect to the Sanitary service. He would suggest that people like him should exert their influence to invite the Royal Sanitary Institute to train their officers specially in animal husbandry. They trained their officers in meat inspection, but so far as he knew, there was no branch of the service which made a special point of training in housing and handling livestock, and that sort of thing. But he agreed with Colonel Dixon entirely that if such a body of men were in existence they should be under veterinary control.

Could they lay down a principle defining their position in public health? He thought that Mr. Ritchie had touched on it, and had been misinterpreted. He would say with Mr. Ritchie that they were concerned with the welfare of the cow as a cow for her own sake and only secondarily with the welfare of the human folks that had to submit to the products of the cow, and if they laid that down quite clearly he thought it would influence a great many of their actions to a large extent. What Mr. Ritchie said, as he interpreted it, was that they should base their plea for action in respect of contagious abortion on the point of economics and not of public health. (Applause.) Dr. Thomson had taken very great exception to that. He was sure that they would agree with him that Dr. Thomson was a very welcome visitor to that meeting. (Hear, hear.) Dr. Thomson would appreciate his point when he said that he began to take an interest in milk nearly 40 years ago. (Laughter.) He thought that Dr. Thomson had misinterpreted Mr. Ritchie, and as Mr. Ritchie had no right of reply he would not mind if he replied for him, rightly or wrongly. Dr. Thomson seemed to say that they were pleading for the welfare of the agriculturists. He did not think Mr. Ritchie meant that, but what he meant was precisely that they were interested in the health and welfare of the cow herself, not so much in the pocket of the farmer, and that they could leave it to Dr. Thomson and his colleagues to deal with the welfare of his patients.

Whether they were to be given control of such things as the processing of milk and the distribution of milk—which Colonel Dixon had urged so strongly—seemed to him to be a matter which could be argued in another direction, but there could be no real dispute that they were the people who should have full control of the housing of cattle and of the whole of the management and transport of not only cattle, but all the domestic stock. There had been a considerable difference of opinion on that. It was not yet admitted by the medical profession or by the principals of agricultural schools that they were the right people, but he thought it was axiomatic and that it would be acceded if they did their job properly. (Hear, hear.) In his view, they were as well qualified as the medical officers to control distribution, but he could not see that it was their natural work; it would be that only if it were given to them, and he hoped that Dr. Thomson would use his influence to see that they were given it, because he could assure him that they could do it. Belfast was a city where some of them the previous day had had a very good illustration of the value of unity of control in meat inspection, and that question of unity of control in milk was, if anything, more important than it was in meat.

He did trust that Mr. Dolan would not take offence, but he was hoping that the discussion would follow the general question rather than the details of high grade milk production or the value which they might recognise the self-contained herd to possess.

Major W. J. B. DeVine (Birmingham) said he was very interested to see the slides and hear Mr. Dolan's remarks.

He quite agreed with what Mr. Ritchie had said, and he (Mr. Ritchie) suggested it was almost insane to attempt to maintain a tubercle-free herd by buying in. (Hear, hear.) He agreed with that, not quite 100 per cent., but almost that. They could not maintain a tubercle-free milking herd by buying their animals to maintain their numerical strength. They must, if they wanted success, breed the animals at home. But it was possible if they were buying yearlings up to two years old to maintain a tubercle-free herd if they bought them empty and allowed them to grow at home until they became milch cows; therefore when they made the statement that they must not buy in he would not agree with it absolutely, but he quite understood what Mr. Ritchie meant by buying in. He had seen tragedy after tragedy where it was sought to maintain the strength of the herd by that means. He had been connected with the maintenance of tubercle-free herds now for something like close on 30 years and he had suffered an exceptional amount of misfortune and disappointment simply because new animals were being brought in from time to time, bringing infection with them.

As regards the testing, nowadays they were in a much better position than formerly. The intradermal test was much better, giving a lower percentage of doubtful cases. If they got a non-reactor they could pass it, but if not definitely free they could not, and he did not think they should ever be passed.

He was interested to see, in the slides submitted by Mr. Dolan, certain sheds. He thought the construction of the sheds had as much to do with

the cleanliness of the milk as anything else. He was interested to hear his friend, Colonel Dixon, state as to who should advise as to the construction of sheds. He agreed with him entirely. The veterinary surgeon was trained in hygiene, and contruction of sheds, and ventilation, and light, and everything else connected with the housing of domestic animals and he was an expert on that subject. He (the speaker) was egotistical enough to consider himself an expert on the construction of cowsheds. He had looked at sheds all over Europe. He had been through the Dutch byres, Denmark, and various other places, and he had absorbed various ideas. Two or three weeks ago he was in the North of England and he was invited to see a shed in the process of erection. It was a very good shed indeed, but he told the occupier—a farmer—that he would have dirty cows in it. It was only a simple matter, and he would like to illustrate it on the board. [The speaker proceeded to illustrate on the black-board the defects in the shed in question.] He explained that the distance from the front wall to the manger was over two feet six inches, and the cow was able to stand forward and dung on the bed and then lie in the dung.

They would always have controversy as to who should look after animal sheds. He was willing, if he got a little notice, to take up the argument with Mr. Matthews or any other gentleman. He was convinced himself—and he thought there were a lot of other sane gentlemen who were likewise convinced—that the veterinary surgeon was the man who should be consulted and who should advise about the construction of cowsheds. When it came to the handling and the distribution of the milk it might be taken up by the sanitary inspector and the medical officer of health, for they saw the food handled and traced any disease from house to house. That was not within the ambit of their (the veterinary surgeons') work.

He was very interested to hear the remarks of Dr. Thomson, the Medical Officer of Belfast, and Mr. Matthews. He was of the opinion that neither of them understood the remark of Mr. Ritchie. (Laughter.) Not that he wished to contradict those gentlemen, but he took it that Mr. Ritchie was speaking of undulant fever in man and contagious abortion in milk cows. He quite agreed with him there were very few cases of undulant fever in man, and they got a high incidence of contagious abortion in cattle; it was therefore the duty of the veterinary profession to attack that disease, and attack it from the agricultural and economic rather than from the public health point of view. When cases of undulant fever were reported in the town in which he had lived the Medical Officer of Health asked them to examine the cows. He (the speaker) had had a fair number of such cases reported to him within the last few years, and examination of the cows always disclosed contagious abortion.

Mr. F. A. Davidson (Stafford) was the next speaker. At the outset of his remarks he said he would first come to the strict interpretation of Mr. Dolan's paper: "The Position of the Veterinary Surgeon in Relation to Milk." They had heard it discussed. The medical officer of health had been brought into it, as had the sanitary inspector.

In the first place, they must admit that the medical officer of health must have the final say on any food products reaching the public for consumption, but the person to control the milk until it reached the public he considered should be the veterinary surgeon, whether it were in regard to production or distribution. On the distribution side certainly the medical officer and the sanitary inspector had training, but he considered the veterinary surgeon's training better and more up-to-date.

Then, to come to cowsheds, he was rather interested because he had been eight years in a county where in connection with meat and milk only one department had anything to say in regard to buildings and that was the veterinary department. Was their education at the present moment sufficient to enable them to undertake that? he asked—and he issued that word of warning to the colleges. It was time we put our house in order, continued the speaker.

There was another thing. While he said that the reconstruction of dairy premises should be in the hands of the veterinary officer, yet there were certain points which must be left to the sanitary inspector, such as the observance of bye-laws controlling building materials and designs. No such matters were included in the veterinary surgeon's curriculum.

Dealing with the question of water supply and drainage, Mr. Davidson said he had often advised on water supplies for farm premises, and drainage, but as often as possible he brought in the sanitary inspector. In Staffordshire, he was pleased to say, the dairy premises had been handed over to his department, as far as the County Council was concerned.

He had not adopted Colonel Dixon's attitude completely: he would always consult the sanitary inspector. They must take the wide view and include the domestic premises also with regard to drainage and water supplies of any extent and the sanitary inspector had more idea of the engineering problems than they had. They could deal with them only very perfunctorily, and he was afraid that many of their text-books and the colleges were out of date. As regards the planning of premises, this should be in their hands, but, as he had said, they must be fit to take it over. Mr. DeVine had given them a very interesting sketch on the blackboard and he quite agreed with some of his points. He was on the right lines. The speaker commended the farm buildings at Dumfries and suggested that any members who were returning home by the Larne-Stranraer route, and through Dumfriesshire, should visit them; they might pick up many practical points, and Mr. Sangster would give them information on the matter.

The speaker expressed the view that it was no use their going into watertight compartments with regard to the work of the medical officer of health, the sanitary inspector and the veterinary surgeon.

Coming to a point that had created considerable discussion there, as to what Mr. Ritchie meant—(laughter)—he agreed with Mr. DeVine that he was referring to abortion. He would say to Dr. Thomson that his own attitude as regards milk was that the public must get the benefit of the doubt and he could tell Dr. Thomson that that was Mr. Ritchie's opinion also. As regards the agricultural aspect, the problem to be tackled successfully from the public health point of view must be tackled from the agricultural one. There were three main overhead charges—feeding, labour, and losses from disease—and if any farmer tackled the management of his herd, keeping those three points

in view, he would produce a satisfactory milk supply as an automatic result.

If farmers would realise that disease cost anything up to, and over, a penny per gallon—and even a farthing a gallon brought in much—and set out to bring in that penny extra profit, they would have a clean milk supply, and he thought that was the solution. They must make the farmer realise that he was going to put a penny in his pocket if he tackled the problem.

To come to the question of tubercle and tubercle-free herds, they had heard much on what Mr. Dolan and Mr. Ritchie had said. He would like to emphasise Mr. Ritchie's point in connection with buying-in. He was very pleased the previous day when Colonel Dixon told him about some very successful results from cattle he (the speaker) had the privilege to secure for a dairyman in Leeds. The stock which the latter had bought from other sources reacted six months afterwards, but stock recommended by Mr. Sangster himself were there three years and there were no reactors. It would take far too long to go into that. They had heard much criticism of the Tuberculosis Order and the Ministry in connection with their Order. No doubt it was not perfect, and he admitted it would never eradicate disease or completely eliminate tuberculosis from milk, but much of its failure, he considered, was due to the officers who had been carrying out the Order limited by their interpretation of the scheduled classes of the disease, especially Class D. He had always found the Ministry anxious to support him in the widest interpretation of the Order, and much better results were secured if a wide interpretation was given. (Applause.)

Proceeding, Mr. Davidson stated that another point was that the profession in tackling the milk problem were relying far too much on samples and tests in the laboratories. What did they go to college for? One of the essentials was clinical observation and early diagnosis. He would warn veterinary officers not to depend too much on laboratory tests, thus wasting time and increasing expenses.

In his opinion, actinomycosis of the udder was much commoner than he thought Mr. Ritchie believed. They had good evidence in Dumfriesshire of this.

As regards undulant fever, he did not think that any clear case had been made out against milk and often very good evidence was obtainable to contradict that, in the form of direct contact.

Mr. H. W. Steele Bodger (Tamworth) said that he felt he should be lacking in his duty if he let that meeting adjourn with the idea that there was only one section of the veterinary community in existence.

In the first place, he would say to Mr. Ritchie he did not want to put any interpretation on his remarks. (Laughter.)

In the second place, he would like to express his amazement that they had evidence of such a wide difference of opinion between his friends, the veterinary inspectors. So wide had been that gap that he would suggest to his very good friend Captain Simpson, that the subject for a paper at one of his subsequent meetings might be that very paper, and if there were any survivors from the discussion, then they, the poor downtrodden practitioners, should be very glad to meet the survivors and discuss the issue and tell them how cowsheds should be constructed, milk produced and tuberculosis eradicated. (Loud laughter.)

He was amazed to hear Colonel Dixon suggest that there was anything to take exception to in the Gowland Hopkins Report, as he had a very vivid recollection that he moved that the Report should be accepted in its entirety.

With regard to Mr. DeVine's sketches on the board, might he suggest in all sincerity and seriousness that one very important thing in clean milk production was the method of tying, a median chain tie being the best method; the width from the manger front to the head wall could then be three feet or more and cows could not soil the standing.

With regard to the position in Staffordshire and his friend, Mr. Davidson, and the wide interpretation of the Ministry, he should like to tell Mr. Davidson that as a result of an interview with the Ministry they were informed that one of their requirements for Grade "A" producers was the possession of a steriliser.

Finally, he would like to inform any of them who were returning to England by air or boat, if they wanted to see some really good cowsheds, that Tamworth was near Birmingham. (Applause.)

Mr. W. Tweed (Sheffield) was the last speaker in the discussion. He said he would like to congratulate Mr. Dolan on the initiative he had shown in writing this paper. Mr. Dolan had raised the point about obtaining an adequate water supply; it had been his experience that that was mainly the crux of the question of milk production. A lot of farmers spent half a day's work carrying water in milk cans. He thought they should bore for water before they talked about clean milk production—on some farms at any rate.

Concerning the production of clean milk it had been his experience that if they talked to the farmers about getting rid of disease, the farmers would get to know what bacteria meant. If they could be made to understand that bacteria caused disease, they would take greater care of their cattle and the production of clean milk would follow.

They, as veterinary surgeons, ought to be attacking disease and he was very pleased to hear Major DeVine contribute something on the eradication of tuberculosis.

Birmingham has had for a number of years a scheme which encouraged the farmers to eradicate tuberculosis. From their experiment it might be possible to discover whether tuberculosis might be eradicated by dividing England into areas of eradication.

When Ulster's new Veterinary Officers began their eradication scheme, their export trade in tubercle-free cattle would prove a great asset to this country.

The Reply

Mr. P. F. Dolan (Dublin), in replying, expressed his thanks to the Members for the way in which they had received his paper, and explained that the paper had been written from a practical point of view and from observations he had made in visiting dairy farms.

He wished to thank Mr. Ritchie for the way in which he had added to the paper, and for the very small amount of adverse criticism: he himself thought the paper was very much open to criticism, however.

He had very little to say on Mr. Ritchie's remarks except on two points. The first was the question of the purchase of new cows for tubercle-free herds. Those cows must be pur-

chased at some time or the tubercle-free herds would break down for the want of numbers, over, say, four or five years. It was not always easy to obtain cows from another tubercle-free herd, and farmers, now and again, under special conditions, must go to the market and purchase new cows. Those cows could be purchased satisfactorily and kept tubercle-free provided that they were properly handled; and the main point was that the veterinary surgeon's directions were taken and carried out in detail in the isolation of those cows on the farms. It was not a difficult thing to isolate two or three cows on their arrival at the dairy farm in the winter time when the cows were tied up, if kept tied in a shed by themselves, or they could be tied up at the end of a shed at the nearest point to the outlet of the drainage, and those cows could be isolated there, provided the instructions of the veterinary surgeon were carried out. In the summer time when the cows went to grass it was a different thing, because they must have a separate field, and that was not always easy. The purchase of cows was not to be advocated, it is dangerous, but, in special circumstances, it should not stop a person from forming a tubercle-free herd.

With regard to diphtheria or scarlatina, he had often wondered if those diseases had been definitely proved to be transferred from milk, the cow being responsible. Dr. Thomson—who, he was very sorry to see, had to leave—had described a case of diphtheria to them, where they went to a farm and took a swab from the throat of a boy on the farm. He would just like to make the point, if that boy had been working at pasteurising plant in any depôt in the country would not the danger be exactly the same? He did not object to pasteurisation, and they as a profession could not object. They must support the pasteurisation of certain milks, but they wanted to develop the production of high grade milk and to allow the public to obtain a high grade raw milk. They should be allowed to develop that, and they should not support the pasteurisation of all milk—he did not think that was sound. In his view, there was a tendency to go too much to pasteurisation.

Mr. Matthews had raised the question of the title of the paper. He was not clear on Mr. Matthews' point. He would like to say that the title of the paper was selected for him, and he believed if the measures were adopted as suggested by him there would be no diseases communicated to man from milk; therefore, he thought that fitted the title of the paper. (Hear, hear.)

Mr. DeVine had asked him a question on the slide of the white cow showing the elbows turned out. He was sorry he was a bit hurried over the slides. He should have said it was a symptom of a cow having great difficulty in breathing. The appearance of the cow's legs drew the attention of the veterinary inspector, and he got the sputum and the cow was slaughtered, showing extensive lesions of tuberculosis of the lungs. The point was that the elbows turned out, and drew the attention of the veterinary inspector to the cow.

As regards the question of contagious abortion from an agricultural point of view and a public health point of view, of course the agricultural point of view is the important one. There was no doubt on that. But they must remember that the public were asking for a guaranteed disease-free milk, and it must be supplied. Also the question of contagious abortion and undulant fever was being utilised by interested parties against the sale of a raw high grade milk.

Mr. Davidson, had made, to his view, an extraordinary statement, that sanitary officers in certain respects were much better trained, especially in buildings, than they were. His observation on that was that they could not accept that. (Applause.)

[*Editorial Note.*—It will be observed that Mr. Davidson made use of the word "bye-laws" in his remarks. It was evidently a mishearing on the part of Mr. Dolan that led him to understand Mr. Davidson to use the word "buildings."]

Clinical Communications

BRACKEN POISONING

J. LYNCH, M.R.C.V.S.
New Ross, Co. Wexford

August 19th, 1934.—I received a message by 'phone that a client some nine miles away had some calves sick. I learned that one animal had died the previous day and that another was ill, the only symptoms noticed being that the sick animal was snoring and that the one that died had exhibited the same symptom. I did not consider this of any importance at the time, as it is common.

Visiting the farm within an hour of receiving the call, I found seven cross-bred Herefords, aged from four to eight months, three heifers and four bullocks.

The sick animal, on casual examination, showed no disturbing symptom. There was slight salivation and it was entirely off its feed. Auscultation revealed nothing unusual. The breathing was slightly hurried and stertorous but not laboured. Palpation of the throat demonstrated slight œdema and even slight pressure upon it intensified the respiratory sound. At this time I was inclined to think there was some obscure infection of the throat.

I next took the animal's temperature, and this registered 106·4°F. I became alarmed and suspected anthrax, malignant œdema, or other acute fever.

I now proceeded to examine the other six animals, watching them for some time. There was slight salivation in every case and occasionally stertorous breathing. The bowels were loose but there was no diarrhœa. The owner had noticed this for some days. In five animals the temperature varied from 106·2° to 107°F. In one animal, which was the oldest (eight months), it was only 102°F.

Enquiry was now made concerning the feeding of the animals, and I was told that the

food consisted of a mixture of linseed and oaten gruel, with skim milk. No fodder was provided and they never left the shed from the day they were calved. They were never allowed out to grass. There was no reason for this except the eccentricity of the owner.

I now asked what litter was used and was informed that they had been bedded with bracken for the previous six weeks or more. I enquired how long the ferns were cut before use and was told they might be cut a day or two but were often used fresh. In reply to my enquiry if he had noticed the animals eat the ferns, the owner replied that he believed they ate all of them.

I was now satisfied this was a case of bracken poisoning although there were other possibilities.

Treatment.—I treated all as follows: equal parts sod. sulph., mag. sulph. and sod. bicarb., giving from 8 to 16-oz. of this mixture, according to size and age, in a quart of tepid water sweetened with treacle. I also prescribed electuary of acid carbol, iodine and treacle to be given to any animal that showed throat symptoms.

August 21st.—On this date a 'phone message informed me that one animal was dead. When I arrived at the farm I was told that the beast was found dead and swollen in the morning. It was the oldest and best, the one that had shown the least symptoms and had had a temperature of 102°F. on August 19th.

The day was intensely warm and *post-mortem* changes would be rapid. There was marked tympany, but more marked still was an emphysematous swelling of the throat and neck.

Post-mortem.—There was gelatinous infiltration of the throat and jugular furrow with a considerable amount of gas formation.

The ingesta in the rumen was semi-liquid and bracken stems were easily discerned. There was nothing else unusual. The second and third stomachs were apparently normal. The fourth was congested, but not to a very marked degree. The liver, spleen and kidneys were normal. The heart was normal, but the right heart was distended with blood. There was a slight excess of pericardial fluid. No petechiæ or blood stains were seen anywhere. The lungs were normal except for some œdema at the base.

What struck me most was the absence of any foul odour from the carcase and the fresh appearance it presented although the beast had been dead more than 14 hours and the weather excessively hot.

Of the eight originally in this bunch only two survived. A week elapsed from the death of the first one to that of the last.

I made a *post-mortem* examination only on the one described.

ILIAC THROMBOSIS

C. W. CARTWRIGHT, M.R.C.V.S.
Dyserth, Flints.

The subject was a three-year-old, well-bred hackney mare used for milk float work. She showed increasing lameness in the off hind, rendering her unfit for work. Upon examination no bony abnormality could be detected, but it was noticed that the whole limb was colder to the touch than the other. This clue elicited the fact that exercise caused increased severity in lameness and ultimately actual distress and while sweating occurred on the rest of the body this limb remained dry and cool. Renal examination revealed slight thickening and weaker pulsations in the external iliac artery on that side.

Iliac thrombosis was diagnosed and in accordance with the accepted grave nature of the condition a very guarded prognosis was given. She was, however, a good mare and well worthy of every chance; therefore she was turned out to grass, while at the same time a long course of powders containing potassium iodide, arsenic and nux vomica was given.

For some time there was no change; then, in about six months, there was definite improvement, which was maintained until, at the end of a further three months, she was sound and back at work.

For the last year she has been in steady work and remained perfectly normal and sound.

Either absorption of the thrombus has taken place or effective collateral circulation has become sufficiently established to constitute what may be regarded as a rare recovery, for records of such appear lacking, while there are ample records of the converse.

SHEEP SCAB IN WALES: IMPROVED POSITION

"Although the double dipping order is in force in Wales there is a general improvement in the position of sheep scab," says *the Oswestry Advertiser*. "There was a slight decrease in 1934 and this has been kept up in the early months of 1935. Taking the country as a whole the number of outbreaks in 1934 was 684 compared with 578 in 1933. The figures for the separate countries which go to make the increase are as follows: England, 491, an increase of 89; Wales, 131, a decrease of 13; Scotland, 62; an increase of 30. It will be seen that in Wales the position has improved while in England the general position is also better with the exception of the high districts of the Pennines and Cumberland. Montgomeryshire as a whole is practically free as far as native sheep are concerned and outbreaks have been nearly always confined to imported sheep."

Abstracts

[Control of Market Milk by the Veterinary Authorities. Schönberg, F. (1934.) *Deuts. tierärztl. Wschr. 42.* 42. 672-676.]

The procedures adopted for the control of various diseases have been recorded. The full details are only of interest to specialists, but a brief outline of the methods of examination which have been found the most reliable is of general interest.

Tubercle bacilli.—Reliance is placed on the biological test, using guinea-pigs. All guinea-pigs are subjected to the tuberculin test prior to use. They are then injected intramuscularly with a mixture of cream and centrifuge deposit. Necrotic lesions appearing at the site of inoculation are treated with dressings as it is thought that such a procedure decreases the losses from intercurrent infections. Guinea-pigs are examined two to three weeks after inoculation, the superficial lymphatic glands being palpated. Where there is evidence of glandular enlargement the animal is killed and examined or else the affected gland is excised by a surgical technique. Such glandular material is then examined microscopically and by culture.

Br. abortus.—Whole milk is tested by a rapid agglutination test. Samples which give an obvious positive reaction are then inoculated into guinea-pigs as above. Following extirpation of enlarged glands, material is cultivated on liver agar in tubes sealed with paraffin as this procedure is found to give a CO_2 tension within the tube suitable for the development of *Br. abortus*. Subsequently, blood is collected from each guinea-pig and is tested for the presence of specific agglutinins.

Mastitis Infection.—A microscopical examination is made for the presence of pus in the milk. Pus is recognised as a large admixture of clumps of degenerated leucocytes, desquamated epithelial cells and possibly streptococcal chains. Normal milk contains some cellular elements so the dividing line between normal and purulent milk is taken as a leucocyte count of 30 cells per field when milk is examined by a Breed technique under a Zeiss No. 1 ocular and a 1/12th oil-immersion objective. The amount of centrifuge deposit is also measured in a tube with a constricted base, and the deposit resulting from ten minutes' centrifugation at 3,000 r.p.m. is examined for the presence of pus and pathogenic organisms. If no mastitis organisms are seen during the microscopical examination, cultural tests are resorted to, using serum-glucose-agar as the medium.

In addition to the foregoing examinations milk is tested for the presence of organisms of fæcal origin, and for the presence of an admixture of heated milk. E. J. P.

[Time Factors in the Pasteurisation of Milk. Hall, J. W. (1935.) *Brit. Med. J.* May 11th. 972-974.]

It is shown that if the pasteurisation of bulk milk is delayed the bacterial count of the milk rises rapidly, even if the milk is stored meanwhile at comparatively low temperatures of 40° to 45°F. It is thought that if milk were pasteurised as soon as possible after milking, instead of immediately prior to distribution to the consumer (*i.e.*, as long as 16 hours after milking), the consumer would receive the milk in a better condition than is at present the case. In fact, the writer goes so far as to suggest that milk should be flash pasteurised on the farm instead of being cooled, and evidence is presented to support the value of such a procedure.

[The expense of the necessary apparatus, and the need of the full-time services of a skilled technician to run the apparatus efficiently prohibit the adoption of such a scheme. In addition, it should be indicated that such flash pasteurisation would only be of value if the milk was treated, thereafter, in an aseptic fashion. Pasteurisation destroys or lowers the natural power of milk to inhibit bacterial growth; consequently organisms subsequently gaining entrance to the milk would have adequate opportunity to multiply during the long periods of transport under trying conditions of temperature.

To handle and bottle milk on an average farm under aseptic or semi-aseptic conditions is impracticable. Under present-day conditions milk is pasteurised and the saprophytes are destroyed when the natural preservative power of the milk is on the wane. Finally, at the present time the distributing firms can control the cleanliness of the farmers and the freedom of their herds from disease by carrying out suitable tests of the bulk milk. If milk were to be pasteurised on farms this method of control would be worthless.]

E. J. P.

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[Examination of Milk Products for Tubercle Bacilli and *Br. abortus.* Pullinger, E. J. (1935.) *Lancet.* I. 1342-1344.]

Milk products including cream, butter, hard cheeses and soft cheeses were examined for contamination with tubercle bacilli and *Br. abortus*. Out of 31 samples of raw cream, 16 contained tubercle bacilli, eleven *Br. abortus*, whilst twelve samples were free from both contaminants. These organisms were destroyed by flash pasteurisation of the cream at 82·5°C. Neither contaminant was found in 39 samples of butter which were examined, but the bulk of these had been prepared from pasteurised cream. Evidence is quoted from the literature

to show that butter may contain virulent tubercle bacilli. Tubercle bacilli were isolated from four out of nine Cheshire cheeses when these were examined immediately after manufacture. When cheeses similarly contaminated were examined after storage for two weeks or more, the tubercle bacilli had died out. Since hard cheeses are allowed to mature for at least three months prior to sale, there is an adequate period during which autosterilisation may take place. No tubercle bacilli or *Br. abortus* were isolated from samples of Cheddar, Stilton, Bondon or Little Wilts. cheese.

E. J. P.

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[**The Diagnosis of *Br. abortus* in Milk.** Plate, G. (1934.) *Deuts. tierärztl. Wschr.* *42*. 34. 537-543.]

In this article is discussed the practicability of diagnosing the presence of *Br. abortus* in milk by the systematic examination of the milk for specific agglutinins. For such an examination to be carried out as a routine procedure on a large scale, it would be necessary to use a rapid agglutination test in which whole milk could be employed. Investigations using such a test showed that out of 413 samples from individual cows, the rapid test recorded 283 as negative or showing unspecific agglutination. Brucella was not isolated from any of this negative group; but was found in 32 per cent. of those showing a weak positive reaction, in 61 per cent. of those showing a medium positive reaction and in 89 per cent. of those showing a strong positive reaction.

In a group of 744 samples of bulk milk, of those giving a negative or unspecific reaction 2·3 per cent. were found to contain Brucella; whilst these organisms were isolated from 7 per cent. of those showing a weak positive reaction, from 32 per cent. showing a medium and from 50 per cent. of those showing a strong reaction.

These results indicate that a rapid agglutination test of whole milk would be of considerable practical value in eliminating samples of milk definitely free from agglutinins. Those which give positive reactions could then be subjected to biological or cultural tests for confirmation.

E. J. P.

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[**The Chemotherapy of Contagious Bovine Abortion.** Götze, R., and Müller, J. (1934.) *Deuts. tierärztl. Wschr.* *42*. 30. 469-474.]

The prophylactic and curative properties of certain preparations were investigated. For prophylaxis, two to five months-pregnant non-reacting cows were treated with the preparation and then fed 100 c.cm. of virulent culture, dosage of the drug and the culture being repeated as many as five times. For curative investigations, similar cows were fed 200 c.cm. of culture followed by therapeutic treatment.

Three heifers treated with a 5 per cent. solution of Targesin received no protection. Mixed dosage with methylene blue, Targesin and tartar emetic on the one hand and Trypaflavin and Targesin on the other was equally ineffective. Similar results followed the administration of Naganol and Benzoptol.

Following a similar experimental procedure, 16 heifers were treated with substances called Nos. 54, 43 and 75. Of these, eight remained free from infection whilst three of the remainder, though becoming infected, gave birth to normal calves. Using preparations S_1 and S_2 no curative or prophylactic property could be demonstrated. Using S_3 and S_4, five heifers out of six remained free from infection.

Summarising these results, 14 heifers were treated with silver preparations or S_1 and S_2 and all of these animals became infected with contagious abortion. Of 22 heifers treated with one of the following preparations, 54, 43, 75, S_3 or S_4, 13 remained entirely free from the disease though exposed to the same degree of infection as the foregoing group. Unfortunately no information is given regarding the chemical identity of these preparations.

E. J. P.

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[**Diagnosis of Bovine Mastitis.** Steck, W. (1934.) *Schweiz. Arch. f. Tierhlk.* *76*. 8. 393-418.]

Four main methods are available for the diagnosis of mastitis. (*a*) The examination of milk for the presence of admixture with mastitis exudate. This is indicated by a low milk sugar content, an alkaline reaction and a strong catalase reaction. Whilst these factors may be of importance in determining the quality of milk, none of the tests which fall under this heading are entirely reliable as they merely measure slight variations from the normal. Variations can only be recognised as such when they are of considerable magnitude and consequently though tests reveal acute cases of infection they are of but little value for picking out latent cases. (*b*) Palpation of the udder and associated lymph glands for changes of consistency, temperature and sensitiveness. Once again such examinations, though useful for identifying acute cases and long-standing chronic cases where considerable change has occurred, do not reveal cases of latent infection. (*c*) Macroscopic and microscopic examination of milk sediment for red blood corpuscles, leucocytes and mastitis streptococci. When blood can be seen or there is a striking increase in the number of leucocytes mastitis may be diagnosed with certainty, a similar diagnosis may be made if chains of mastitis streptococci can be seen. However, latent infection cannot be recognised by such an examination. (*d*) Culture of the causal organism. For this purpose

agar plates, saccharose-bromcresol-purple agar plates, crystal-violet-æsculin-blood agar plates or deep serum-glucose-agar tubes may be used. Cultured on plain agar, mastitis streptococci can only be recognised after considerable experience. On saccharose-bromcresol-purple agar colonies of mastitis streptococci are generally surrounded by a yellow halo. On crystal-violet-æsculin-blood agar beta-hæmolytic streptococcus colonies are surrounded by zones of hæmolysis, whilst with non-hæmolytic streptococci colonies of saprophytic varieties develop a black colour which is not produced by pathogenic varieties. In deep glucose-serum-agar, mastitis streptococci grow in the depths of the medium. Cultural methods identify mastitis streptococci with considerable accuracy, but it is necessary to carry out further test upon organisms which are isolated to identify them with greater certainty. Cultural examinations of quarter samples from a cow is by far the most reliable test for mastitis, but complete reliance should not be placed upon a single negative result. Repeated examinations of herds should be carried out.

E. J. P.

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[I.—An Investigation of the Causal Agent of Bovine Pleuropneumonia. Tang, F. F., Wei, H., McWhirter, D. L., and Edgar, J. (1935.) *J. Path. Bact.* *40.* 391.]

[II. — Contagious Bovine Pleuropneumonia. Note on Experimental Reproduction and Infection by Contact. Daubney, R. (1935.) *J. Comp. Path.* *48.* 83.]

I.—The authors believe that pleuropneumonia was first introduced into China in 1919 when an outbreak occurred in Shanghai among a shipment of milk cows from Australia. In 1931 another outbreak was reported in the same city among animals from Manchuria. Since then, the disease has become endemic in Shanghai and has invaded neighbouring areas. This paper deals with investigations made on the "causal agent" of the disease. Eight strains of the micro-organism were examined. Three were obtained respectively from Khartoum, London ("Lister" strain) and Germany, the last two being referred to as "old" cultures, and five were recovered from cases in the Chinese epizoötic. These are described as "fresh" strains. The methods of recovery of the micro-organism by plating on serum agar plates or by serial dilution in serum broth, although relatively simple, did not always give satisfactory results. The method giving the best results was to centrifuge pleural exudate or the expressed fluid from infected lung tissue and subsequently dilute the supernatant fluid in broth before filtration through a Berkefeld V candle. The filtrate was sown in varying amounts, 0·25, 0·5 or 1 c.c., into broth-tubes. The micro-organism was grown in broth to which 10 per cent. horse serum was added or on semi-solid or solid media consisting of this medium with addition of 0·5 or 2 per cent. agar.

The first sign of growth with "fresh" cultures in broth was, frequently, the appearance of "islands" or "threads," especially when the inoculum was small in amount. "Old" cultures such as the "Lister" and German strains never showed this, but only general clouding of the medium. Another observation of interest was that "fresh" cultures reduced hæmoglobin. The less the strain had been cultivated artificially the stronger was the reduction and the earlier its occurrence. An "old" culture was not capable of reducing hæmoglobin.

The authors made a morphological study of the micro-organism by dark ground examination of growth in broth or colonies on semi-solid agar and also by examination of stained smears prepared from broth and impressions from solid media.

In the case of an "old" strain, colonies on a semi-solid medium by dark ground illumination appeared to consist almost exclusively of rings and granules arranged in three zones, while in the case of a "fresh" strain, the appearance of the colony was different in that although the middle zone consisted of some rings and granules there were mostly filaments and in addition there was a peripheral zone of long radiating filaments with protoplasmic streaming within them.

The broth culture of an "old" laboratory strain was also found to consist "mostly of rings and granules."

On the other hand, in freshly recovered strains the authors described five stages of development in broth: (1) the resting stage or stages of "elementary bodies" consisting of rings and granules and a few diplococcoid and bacillary bodies; (2) the filamentous stage consisting of formation of filaments from the dendritic protrusions of the "elementary bodies"; (3) the stage of ramification consisting of branching and sub-branching of filaments; (4) the stage of chain formation consisting of chains of various types by the consolidation of protoplasm in the filaments; (5) the stage of disintegration in which the chains were broken up progressively into "elementary bodies."

From their observations the authors conclude that in "old" strains the reproduction of the virus is by simple budding, and is therefore different from that occurring in cultures of recently recovered strains. They say further: "Our observations on the two distinct systems of multiplication existing in two kinds of cultures, freshly recovered and "old," appear to clarify many of the former controversies. For

instance, the disagreement between Barnard (1925) [*Lancet*, ii, 117] and Smiles (1926) [*J. Roy. Microsc. Soc.*, *46*, 257] as pointed out by Ledingham (1933) [*J. Path. Bact.*, *37*, 393] is now explainable according to our observations: for Barnard might have worked with an 'old' culture which multiplied by simple budding while Smiles experimented with a fresh strain which exhibited cyclic development."

[Actually there are several facts which require reconciliation before the whole position is made clear. Smiles, who described filamentous forms "of low visibility" in early stages of growth of the micro-organism, employed the same strain as Barnard. Further, Orskov (1927) [*Ann. Inst. Pasteur*, *41*, 473] and Ledingham (1933) [*loc. cit.*] both examined this strain and described filamentous forms, particularly in the early stages of culture of the organism. Ledingham also stated that he had examined two strains of more recent origin, one Japanese and one Chinese, and no essential differences were observed between the elements in these newer cultures and in the "old" strain.

The "Lister" strain referred to by Tang, Wei, McWhirter and Edgar as an "old" strain is the Japanese strain "Omishi" [National Collection of Type Cultures, Strain No. 3720] in which Ledingham described filamentous forms, and yet one is confronted with their observation that in "old" strains the reproduction of the virus is merely by simple budding. The whole question, therefore, instead of "becoming clarified," to the outside observer, appears to become more confused and must still be considered *sub judice*. It may be recalled that Freiberger (1912) [*Z. Infekt. Haust.*, *12*, 455] and Frosch (1922) [*Arch. wiss u. prakt. Tierhlk.*, *49*, 35, 273] suggested that not only the dark ground findings but also those originally described by Bordet (1910) [*Ann. Inst. Pasteur*, *24*, 161] and Borrel, Dujardin-Beaumetz, Jeantet and Jouan (1910) [*Ann. Inst. Pasteur*, *24*, 168] in stained preparations were probably not genuine formed elements of growth but artefacts produced by changes in the medium or by other means. The present authors state that they "examined numerous specimens of uninoculated media controls, with and without the addition of serum, but were unable to find the long branching filaments with streaming protoplasm, though dancing particles, rings and even short stationary filaments were present which, however, showed no signs of growth." The examination of such controls, however, could hardly be considered as likely to provide an answer to the criticism that certain of the forms or appearances described in cultures may be due to particular dispersions of the protein or other constituents of the medium resulting from the growth of the micro-organism. Two observations which were made by Tang and his co-workers are of some significance, *viz.*: (1) "that slight mechanical pressure may result in the formation of some peculiar forms such as quadrangular or yeast-like bodies" and (2) "if a drop of glycerine was mixed with a similar amount of filamentous growth, the latter would immediately be transformed into rings and granules." So that surface tension may have a considerable influence on the appearances observed. The observations made by the authors on the filterability of the micro-organism are not convincing.]

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II.—Many attempts have been made to reproduce the pathological picture regarded as characteristic of the disease by inoculation of cultures of the micro-organism first demonstrated by Nocard and Roux (1898) in the thoracic lymph from cattle affected by contagious bovine pleuropneumonia, but without success. Similar negative results, however, have also been obtained by inoculation of fresh thoracic lymph from cases of the disease.

Subcutaneous inoculation of cultures of the micro-organism or lymph, even in relatively small amounts, may produce intense œdematous reactions accompanied by an inflammatory process in the subcutaneous tissues similar to that seen in the lung of animals contracting the disease under natural conditions. In many instances the reactions produced by subcutaneous inoculation are very severe and death ensues, but in fatal cases the lungs are not found to be involved. Even when a culture or lymph is inoculated directly into the pleural cavity, the inflammatory reaction does not attack the lung itself.

[Again, although the respiratory tract is believed to be the path of infection by which animals become infected, and indeed the nasal and bronchial secretions are sometimes found to be infective, there is little experimental evidence to support this belief.

Nocard and Mollereau injected fresh lymph into the trachea of two cows; no symptoms resulted, but the animals developed an immunity and this was taken as indirect proof of the absorption of the virus. However, attempts to infect by the tracheal route have usually been without effect unless a local subcutaneous lesion was produced accidentally by escape of some of the inoculum at the time of the tracheal injection.

Nocard and Roux found that cattle which had received by inhalation a culture in the form of a powder, developed febrile reactions and sometimes lung lesions. Animals inoculated in this way were later found to be immune.

Chaveau joined the heads of an infected and

a healthy susceptible animal together by a tube made of linen and the latter animal became infected. Apart from this single experiment, however, there is no evidence of contact infection ever having been induced under strictly controlled experimental conditions, and little is known about the method of spread of the disease under natural conditions.

As regards previous attempts at infecting cattle by intravenous inoculation of cultures or lymph, although Thiernesse as far back as 1854 stated that he observed hepatisation of the lung in one animal out of six inoculated with lymph into the jugular vein, it has been generally found that such inoculations are without effect and do not confer an immunity provided none of the inoculum escapes into the subcutaneous tissue.]

Daubney, in the present article, describes attempts to infect cattle by intratracheal injections or intravenous injections of fresh lymph or first generation cultures of the pleuropneumonia micro-organism and also by contact infection.

In the experiments in attempts to infect by intratracheal injections a total of 18 animals were inoculated with British Berkefeld filtrates of thoracic lymph which were capable of producing severe subcutaneous reactions when inoculated into control animals. Of these 18 animals, one developed an acute pleuropenumonia in which the right lung became almost completely hepatised and there was an extensive pleuritic effusion detectable clinically. This animal died on the twenty-ninth day after inoculation. Macroscopically and microscopically the lung lesions are stated to have been typical of the disease and pure cultures of the pleuropneumonic micro-organism were recovered from the pleural exudate.

The intravenous injections were made in the following way: A measured quantity of lymph or of centrifuged broth culture was mixed with a few c.c. of 10 per cent. agar which was allowed to set in the inoculating canula. The embolus was then forced into the vein by an injection of normal saline from a syringe. Eleven animals were inoculated in this way with thoracic lymph, first generation cultures from thoracic lymph, or first generation cultures from shoulder tumours produced by subcutaneous inoculation. Of seven inoculated with cultures from shoulder tumours five showed no reaction, and of these, three were found to have no lung lesions on autopsy and the two others were not immune when tested subsequently by subcutaneous inoculation. The two remaining animals both developed acute pleuropneumonia. One of these animals died on the seventeenth day after a febrile reaction, and the other, after showing clinical symptoms from which it partially recovered, was killed on the thirty-second day. Both animals showed typical lung lesions on autopsy which were more severe in the former animal than in the latter, and cultures of the pleuropneumonia organism were obtained from the lesions in both cases.

Of the two animals injected intravenously with thoracic lymph, one developed a local swelling subcutaneously at the site of inoculation. Both developed febrile reactions, but no fatal result ensued. Organised sequestra in the lungs which were described as diagnostic, were found on autopsy, but no cultures were recovered from the lesions.

Of two animals inoculated with cultures from thoracic lymph, one showed no reaction, and the other, which developed a local swelling at the site of inoculation, was found to have an organised sequestrum in the lung when it was killed 70 days later. This lesion was stated to be typical of the disease, but no cultures were obtained from it.

It was evidently concluded that the organised sequestra observed in the three animals referred to above were a result of the inoculation.

The attempts to infect cattle by contact gave very disappointing results. None of the animals developed typical acute pleuropneumonia, although some had febrile reactions, and four out of the twelve animals employed in these tests showed small organised sequestra, described as diagnostic of the disease, in the lungs when they were killed some time after the commencement of the experiment.

[Although the number of animals which developed definite acute pleuropneumonia typical of the disease as occurring under natural conditions, after inoculation with fresh lymph or first generation cultures of the micro-organism of pleuropneumonia, is small (one after intratracheal injection [18 inoculated] of fresh lymph and two after intravenous injection [11 inoculated] of an embolus containing a culture of the micro-organism) the results are of considerable interest, for this is the first time that successful results of this nature have been placed on record.]

I. A. G.

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[A Case of Bovine Blackquarter which ran a Course of Forty-seven Days. Wilkens and Schoop. (1934.) *Deuts. tierärztl. Wschr.* *42.* 39. 621.]

A two-year-old bovine suffered from an attack of blackquarter which lasted for 47 days and would have continued for longer had the animal not been slaughtered. At the outset, typical symptoms of blackquarter appeared and a diagnosis was made unhesitatingly upon clinical grounds alone. At this stage no laboratory confirmation of the clinical diagnosis was

attempted or thought necessary. The animal, instead of dying during the course of two or three days, continued to live, and to show symptoms of blackquarter of a mild degree. When slaughtered 47 days after the first onset of symptoms, *Cl.chauvæi* was isolated from the tissues without any difficulty. Assuming that the original diagnosis was correct, as it would appear from the description, infection in this case ran a remarkably prolonged course.

E. J. P.

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[**A Symposium on Entero-toxæmia.** Rose, A. L., and Edgar, G. (1934.) *Austral. Vet. J. 10.* 6.]

Rose presents details of a large number of outbreaks of disease in sheep, accompanied by a heavy mortality, which occurred in New South Wales between the years 1927 and 1934. The cause remained obscure until the publication of Bennetts' work on entero-toxæmia in 1931 when, from the records, it was clear that the great majority of such outbreaks could be explained on these grounds.

Symptoms.—The acute phase is the commonest, accompanied by a high percentage of sudden deaths. Convulsive symptoms and gasping may be observed, however, in young, untailed lambs. Older sheep show respiratory distress with congested mucous membranes, dying in an hour or two. There may be a chronic stage in which the animal wanders about aimlessly picking up bits of stick and rubbish, but this is rare.

An unusual type of the disease which has caused confusion with parasitic infestation in the minds of stock owners is recorded. Whilst the best-conditioned members of the flock are dying the remainder are affected with a foul-smelling diarrhœa. A weak toxin was isolated in such instances. Rose here emphasises the point that although "the normal condition of sheep dying from entero-toxæmia is one of prime fatness it is remarked that this is frequently not the case."

Post-mortem Appearances. — These vary markedly according to the time which has elapsed since death. If the examination is carried out immediately after death little is seen beyond a slight congestion of the mesenteric vessels, sub-endocardial hæmorrhages and œdema of the heart sac. Kidney changes are not marked. The small intestine is practically empty and thickened and pulpy towards the ileum, being here very easily torn. Putrefaction progresses very rapidly, producing marked changes in a few hours. By this time the well-known "pulpy" state of the kidneys can be observed.

The impression very early became current that a rich pasturage was in some way responsible for the disease, deaths occurring frequently amongst ewes grazing on forage crops such as oats and wheat and being heavier in those years when there was an abundance of "keep" following a rainy season. Cases have also occurred on the coarsest of pasture. Walking the fat lambs along a road for several days, docking and weaning were successful in checking outbreaks in some instances and rough handling of the flock in others. Vaccination met with only a limited success.

Entero-toxæmia in New South Wales has a definite seasonal incidence extending from April to October. Sometimes it occurs early, in young untailed lambs only, with no subsequent mortality in the older sheep. In other seasons the reverse is the case.

Edgar deals almost entirely with the laboratory aspect of the disease, discussing more particularly the relationship of the various types of *Cl. welchii* associated with sheep diseases. *Cl. ovitoxicus* is the cause of pulpy kidney in New Zealand, Tasmania and New South Wales. In a high percentage of cases examined in the laboratory in New South Wales smears made from the ingesta of the duodenum, jejunum and ileum showed exclusively large numbers of welchii-like bacilli. For the routine examination for toxin, which rapidly becomes atoxic, the rabbit proved to be highly susceptible to intravenous inoculation.

Gill, after alluding to the two previous papers, refers to the work carried out in England on the toxins of *Cl. paludis* and the lamb dysentery bacillus and gives a warning against the too ready acceptance of the assumption that *Cl. ovitoxicus* is the only anærobe associated with entero-toxæmia in Australia.

Some measure of success is reported with the use of an antitoxin but such steps are not applicable on a large scale.

Details are presented of outbreaks which occurred over a number of years and an attempt is made to correlate climatic conditions and their influence upon vegetation, with the incidence of the disease. "The better the lambs are done the more *likely* is a heavy mortality but other factors come into play. . . . ." Certain factors which might favour digestive disturbance and facilitate the establishment of the organism if present, are discussed.

N. S. B.

IRISH HORSE-BREEDING INQUIRY

The Free State Government announce the appointment of a Commission to investigate the present conditions of the horse-breeding industry and to make recommendations for its improvement. Mr. Justice Wylie will be chairman of the Commission, which will consist of ten members.

Report

WEST RIDING OF YORKSHIRE

Eighth Annual Report of the Chief Veterinary Officer for the County Council

Following the system previously adopted, this Report consists essentially of two parts; the first dealing with the work carried out under the Diseases of Animals Acts and Orders and the second with that of the Milk and Dairies Legislation. The report covers the period from April 1st, 1934, to March 31st, 1935.

The staff consists of one Chief and eight district Veterinary Officers and in addition another assistant is employed primarily on duties under the sheep scab regulations.

We note that there has been an increase in the number of deaths from anthrax which totalled 16 against only two the preceding year. The animals concerned were 14 bovines, one pig and one lioness out of a travelling menagerie.

The serious incidence of sheep scab in the Penine Range was evidenced in the previous year when there were no less than 88 West Riding outbreaks. Fortunately in the year under review the confirmed outbreaks totalled 68, a satisfactory decrease. These were located for all practical purposes in two definite areas of the county. A great round-up of sheep was organised in the summer and autumn of 1934 and four temporary Veterinary Officers were engaged in this work in addition to the permanent staff. No less than 391,354 sheep were double-dipped in the areas of the county scheduled by the Ministry of Agriculture and 219,002 sheep in 1,618 flocks were clinically examined for the presence of the disease. Two patrol shepherds are also employed by the veterinary staff and their services were found to be of the greatest value.

Foot-and-mouth disease, which had not visited the county for nearly four years, again made its appearance, commencing in a herd of swine. Although infected pigs were exposed in Barnsley Market the outbreak was confined to three small farms in the county, all directly connected with the original outbreak.

The number of cattle slaughtered under the Tuberculosis Order reached 1,138 as against 1,173 the previous year. Of the cattle slaughtered 371, or 32·4 per cent., had disease of the udder or were giving tuberculous milk; 603, or 52·7 per cent., had symptoms of pulmonary disease, and 164, or 14·3 per cent., came under the category of Emaciation. Seven animals, or 0·6 per cent., were found not to be affected, but of these three were killed owing to the laboratory report on their milk being positive.

Routine veterinary examination was responsible for finding 590 of the affected cows and bulk sampling of milk, 79.

The veterinary staff carried out 2,762 microscopic examinations of milk, expectorate, blood and other materials.

Under the Milk and Dairies Acts we read that the investigations under Section 4 of the 1915 Act due to reports from other Local Authorities numbered 37 against 50 the previous year. This reduction, however, was not shown in the reports of tuberculosis in milk as found by the County Bacteriological Department, for no less than 104 bulk milks were reported as containing living tubercle bacilli. Only 87 investigations under this category were completed in the year, of which no less than 40 brought no diseased cow to light, a much smaller percentage of unsuccessful results being obtained in the case of complaints from the outside Local Authorities in which only 16·2 per cent. were negative. During the year the veterinary staff visited 16,845 farms under the Milk and Dairies Order and examined 195,104 cows and heifers. One thousand and sixty veterinary samples of milk were sent to the Laboratory for submission to the biological test. Although these were from suspected animals, only 7·9 per cent. proved to be positive for tuberculosis. Much inconvenience was caused by the premature deaths of the inoculated guinea-pigs, for 112 results proved inconclusive from this cause although two guinea-pigs are inoculated in every case. These samples were always repeated if considered advisable.

At the end of March there were only 16 producers licensed to produce certified milk and seven to produce Grade A (Tuberculin Tested). Twenty-nine producers held Grade A licences but the Accredited Producers' Scheme had not begun to operate at the expiry of the period included in this report.

Satisfactory results are recorded during the year in respect of the County herds from which tuberculosis had been eradicated and good progress was made in freeing another large herd.

The report concludes with a table showing the result of inspections in the 147 local sanitary districts and the number of tuberculous cows detected on these visits.

JOHNE'S DISEASE IN AUSTRALIA

Replying to questions in the Australian House of Assembly, the Minister for Agriculture (Mr. Hogan) said that Johne's disease was first diagnosed in Victoria in 1926 and it had been found later on nine other holdings. All the properties on which the disease had been found had been quarantined, the johnin test had been applied and 40 animals which had shown traces of the disease had been destroyed. The question of having the Cattle Compensation Act amended to include this disease was receiving attention.

Review

THE ANIMAL YEAR BOOK, VOL. 3

The above Year Book, which has just been published under the auspices of The University of London Animal Welfare Society at The University Union, 68, Torrington Square, London, W.C.1, is a very complete record of the activities of the society and may be obtained at the price of 2s. 6d., postage 3d.

The society aims at diminishing by methods appropriate to its special character as a university organisation, the sum total of pain and fear inflicted by man on animals. With this aim in view the society seeks to promote, by educational and other means, interest in the welfare of animals at home and abroad, to enlist on behalf of animals the influence of university men and women, and particularly of active and prospective teachers; to disseminate knowledge of the needs of animals and of animal management; and to initiate a movement which shall extend to Continental and other universities. Broadly speaking, the society's work falls under two headings: (1) educational; (2) study of current problems with a view to advocating the best means for their solution. Ordinary membership is open to present and past graduates of the University of London, to senators, officers and teaching and administrative staffs of the university, and to veterinary surgeons practising in London. All members of the public who subscribe 10s. or more per annum are eligible as Fellows, and all who subscribe £5 or more as Patrons.

In a preface to the book Miss C. M. Knight, one of the joint hon. secretaries, stresses the point that a friendly co-operation between various workers for the protection of animals is a desideratum at the present time not only nationally but also internationally; so many of the abuses of animals need international action for their remedy.

In *Chapter I*—Whales and Animal Welfare—by A. H. B. Kirkman, the Editor remarks that the chapter is the outcome of a desire expressed that investigation should be made into the effects of protection in the form of sanctuaries or reserves or legal restrictions in regard to persecution or the well-being of the animals and the survival of the species, and which may be regarded as a first instalment of this vast subject.

In *Chapter II*—Oil Pollution of Coastal Waters—by J. McMath, F.G.S., and L. Parker, M.I.N.A., it is remarked that oil pollution of navigable waters is responsible for the death of innumerable sea-birds under distressing conditions, the destruction of large quantities of fish, and serious interference with the amenities of bathing resorts. The plumage of sea fowl becomes covered with oil and the birds are then helpless: they can no longer fly, swim, or dive in search of food. The chief offenders in oil pollution are oil tankers, tramp ships, the Royal Navy, and oil-carrying vessels which were sunk in the Great War and are just breaking up. Remedial action would appear to lie in the installation of suitably designed oil separators and filters in vessels and in ports, but it is suggested that international action should be taken. As regards action by Humane Societies, both the Royal Society for the Protection of Birds and the R.S.P.C.A. have been very active, not only in organising beach patrols, but in issuing lethal boxes to chemists and police painlessly to put to death any badly affected birds.

Chapter III deals with Perfumes, of which certain animals such as the civet-cat, the beaver, the musk-deer and the musk-rat are well-known providers.

Chapter IV—Humane Education—is perhaps the most important section of the book. It stresses the necessity for the humane education of children, and the importance of including the correct treatment of simple ailments for Guides' and Scouts' organisations until a qualified veterinary surgeon can be called in. It also emphasises the fact that in their personal relationships with animals, adults need instruction as much as children. Lastly, it is essential that students in university colleges, and particularly those who are in training to be teachers, should have definite opportunities of learning about the treatment animals receive at the hands of man, so that they can help to kindle more brightly the torch of humanity. Of the societies engaged in humane education, there are the Humane Education Society, 80, Mosley Street, Manchester; the National Council for Animals' Welfare; the R.S.P.C.A.; the Royal Society for the Protection of Birds; the School Nature Study Union; the Scottish S.P.C.A.; the University of London Animal Welfare Society, and the Young Farmers' Clubs.

Chapter V deals with animals abroad, and some useful and interesting articles have been contributed by various writers, *viz.*: (1) New Zealand, by V. K. le Maistre; (2) Belgium, by Yvonne Buisseret; (3) Czechoslovakia, by F. J. Vinter, M.D.; (4) Albania, by Catherine O'Leary; (5) Greece, by William Miller, M.A., HON. LL.D. (ATHENS); (6) Gibraltar, by Major E. S. W. Peatt, R.A.V.C.; (7) Tangier, by Major Hamilton Kirk, R.A.V.C. (T.F.), contained in two articles reprinted from *The Veterinary Record*; (8) The Society for the Protection of Animals in North Africa, translated from a French report, by Dr. F. Jean Vinter, M.D.; (9) Cairo, by Samia Fahmy (Bedford College), with illustrations; (10) Jerusalem, by Dr. F. J.

Vinter, M.D., with illustrations; (11) Amritzar, by F. J. Vinter, M.D.; (12) Seoul-Korea, by A. S. Millard, M.B., B.Sc., D.P.H.; (13) Turkey, by C. M. Knight, D.Lit.; (14) Dutch Guiana, by F. J. Vinter, M.D.; (15) British Guiana, by D. W. J. Woodman, B.A.; (16) Otani University, Kyoto, Japan, by F. J. Vinter, M.D.; The Meat and Packing Industry of the United States of America, by A. S. Millard, M.B., B.Sc., D.P.H.

Chapter VI relates to some recent books dealing with animals, sent for review through the generosity of various publishers.

Chapter VII, "Is Electric Anæsthesia Genuine," is discussed by Captain C. W. Hume, M.C., B.Sc., from the points of view of (1) Introduction; (2) Some expressions of opinion and the reasons on which they are based; (3) The factors on which electric immobilisation depends; (4) The observed effects of interrupted direct current; (6) The nightmare state experiments on human beings; (7) The nightmare state electrical accidents.

The Appendices include the constitution of the University of London Animal Welfare Society; the aims of the society already mentioned; the society's approach to the Study of Animal Welfare; Educational Work and study of current problems, and the Policy as regards animal experiments, the society being precluded by its constitution from engaging on either side in controversies relating to scientific experiments on animals.

Notes and News

The Editor will be glad to receive items of professional interest for inclusion in these columns.

Diary of Events

Sept. 9th.—Meeting of the Editorial Committee, N.V.M.A., at 2, Verulam Buildings, Gray's Inn, W.C.1, at 4 p.m.

Sept. 24th to 25th.—Jubilee Memorial Prize Examination.

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PERSONAL

Mr. W. Tweed Honoured by Sheffield Wholesale Meat Traders.—At a farewell dinner to Mr. W. Tweed, who has relinquished the post of Chief Veterinary Officer of Sheffield to take up the position of Chief Veterinary Officer for the County of Somerset, the Chairman (Mr. G. W. Fillingham) said they had greatly appreciated the vast improvements at the abattoir initiated by Mr. Tweed, and their only regret had been that more power had not been vested in the Veterinary Department to evolve further advancement. Their trade played an essential and honourable part in the business life of the city, and, like his predecessor, Mr. Tweed had lived to enrich the annals of that trade by his kindly efforts to foster harmony between the Veterinary Department and the industry. They looked forward hopefully to a maintenance of the high principles set up by Mr. Tweed, whom he asked to accept a silver cigarette box, suitably inscribed, as a token of their esteem.

Mr. G. Tullis, M.R.C.V.S., D.V.S.M., Wallasey, and Messrs. Jamieson and Addison, both veterinary surgeons of Sheffield, paid a high tribute to Mr. Tweed's ability as Chief of Staff.

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Appointment.—Mr. F. A. Gordon, M.R.C.V.S., for the past four years assistant to Mr. William Nairn, Erichtbank, Blairgowrie, Perthshire, has received an appointment under the Staffordshire County Council, and goes to Lichfield.

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ARMY VETERINARY SERVICES

The War Office announces that Colonel H. C. Dibben has been appointed Director of Veterinary Services, Army Headquarters, India, with effect from February, 1936, in succession to Brigadier H. S. Mosley, D.S.O.

Colonel Dibben is Deputy Director of Veterinary Services at the headquarters of the Northern Command, India, and has been Assistant Director at home, in France, Salonica, and India. Before taking up his present appointment he was Commandant of the R.A.V. School and School of Farriery at Aldershot.

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HORSE TRAFFIC BAN PROTESTS

Resolutions of protest against Mr. Hore-Belisha's proposal to ban horse transport in the streets of large towns have been submitted to the Ministry of Transport by the National Farmers' Union, the National Horse Association, the Central Landowners' Association, the Clydesdale and Shire Horse Societies, and many constituent organisations in different parts of the country.

Chambers of Commerce, agricultural societies, and private trading concerns are also joining in the protest with blacksmiths, saddlers, and corn merchants.

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ANNUAL CONFERENCE OF POULTRY KEEPERS

About 200 poultry keepers attended the recently-held annual conference at the Harper Adams Agricultural College, when many subjects of industrial interest were discussed. Mr. F. N. Blundell, chairman of the Egg and Poultry Reorganisation Commission, spoke on marketing problems, and expressed the view that the position of the poultry industry is by no means desperate, and that it can afford to take time to consider the marketing question from every angle. He was unable to anticipate the report of the Great Britain Commission, which has been investigating problems of co-ordination and regulation of imports.

Mr. J. H. Prentice, Queen's University, Belfast, gave particulars of experiments in Northern Ireland, with particular relation to feeding. One of the most interesting revealed the value of separated milk as drink for chickens. This experiment showed that whereas a flock of chickens provided with cereals and water attained an average weight of only 23½ oz. at 13 weeks, a group fed on cereals and separated milk, averaged 52¼ oz. apiece in the same period, while the mortality rate was only 1½ per cent. in the

milk group, compared with 20 per cent. among those fed on cereals and water. To farmers this presents one of the most economical methods of feeding, though it is difficult to induce people to adopt it because of its simplicity.

A session devoted to disease problems brought some interesting evidence from Mr. N. Dobson, of the Ministry of Agriculture's Veterinary Laboratory, on laryngo-tracheitis, which was only diagnosed and confirmed in this country in January last. Investigation is still necessarily in the elementary stage, and no cure can be recommended; but a useful leaflet on this disease has been published by the Ministry of Agriculture.

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ULSTER AGRICULTURAL REFORMS

We learn from the *Belfast Telegraph* that, at the Relief of Derry demonstration at Ballinamallard on August 12th, Sir Basil Brooke, Bart., M.P., reviewing Ulster agricultural reforms, pointed out that of recent years sweeping changes had been introduced in agricultural life and conditions in an effort to improve the quality of Ulster's agricultural produce by eliminating disease, waste and inefficiency.

Dealing with the pig industry, Sir Basil said that the increase of the pig population since 1930 and the consequent additional annual income of £1,000,000 was partly due to the fact that the pig grading scheme had been operating very successfully. Farmers were encouraged to produce a better class of pig by a guarantee of a higher price, and it was very satisfactory to note that in recent months more than one-third of their dead pig carcases had been within Grade A.

The campaign for pure milk had also taken firm root, and producers and distributors were co-operating very well. Creamery suppliers, too, were assured of a guaranteed price by a system of equalisation payments.

The cattle-producing industry had suffered more severely than any other from the effects of the general depression. The beef subsidy scheme had been introduced by the Imperial Government last autumn, however, and farmers were paid a subsidy of 5s. per cwt. in respect of fat cattle conforming with the necessary killing-out standard. Subsidy payments amounting to £180,000 had already been made, and provision had been made for the continuance of the scheme.

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ORIGIN OF THE DOMESTIC HORSE

The issue of *Nature* for July 20th contains the following interesting "Research Item," under the above heading.

"In a survey of the evidence bearing on the evolution of the modern domestic horse, Dr. Max Hilzheimer (*Antiquity*, 1935, June) confirms the surprising inference from the bones found in the Royal Tombs at Ur that the early Sumerians had domesticated the Asiatic dziggetai or onager. Bones since found at Tell Asmar include numerous remains of the onager, but none of the animals resembling the horse. There are two, possibly three, varieties of the early horse. It is represented in paleolithic art; but it was not domesticated until neolithic, and, in places, bronze age times. Its habitat was north of the central Eur-Asiatic mountain chain, except for Spain, and extended from western Europe to Mongolia. Of the two varieties, the Tarpan lies west of long. 40°, Przewalski's horse to the east. An early classification divided the domesticated horse into the oriental and our occidental breed, contrasted as in the Arab and the Clydesdale; but an early breed indigenous to Europe and native to Poland is the Konink. Notwithstanding opinion to the contrary, the original home of the Arab or oriental type is Europe, its distinguishing characters being due to climate and careful breeding. The earliest representations appear on the monuments of Assyria dating to the first half of the first millennium B.C., although it had been introduced there long before by Aryan tribes. In varying form this is the horse of the Egyptians, Hittites, Greeks, Romans and Scythians. The so-called occidental horse has been thought to be descended from the pre-historic horse, of which remains are found in glacial deposits of Central Europe; but the break in continuity precludes this view. It first appears in dual form as the Noric horse and the horse of Persepolis of the fifth or sixth century B.C., and there can be little doubt that, like the Arab type, it was the product of breeding and climate which appeared first in the countries, broadly bordering on the North Sea."

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UNDULANT FEVER

Of recent years there has been a marked acceleration in the study of undulant fever, which is now recognised as an endemic disease in almost every country of the world, and inasmuch as the primary reservoir of infection is in animals, and it is from animals that infection is transmitted directly or indirectly to man, the present status of the disease and of its investigation must be of great importance to veterinarians.

The difficulties of obtaining accurate information concerning the probable incidence of undulant fever in this and other countries are very great, partly because, as is pointed out in a recent issue of *The Lancet*, the disease is not generally a notifiable one, partly because active infections with brucella are often atypical, and partly because an exact diagnosis can be made only on bacteriological grounds. Nevertheless, it is significant that, according to Dr. Gunnar Olin, the annual incidence of the disease in Sweden is 18·4 and in Denmark 150 per million, inasmuch as the higher figure for Denmark is partly due, at least, to the larger number of cattle, and the consequent wider distribution of contagious abortion.

In view of the above reference to the association between the incidence of the disease and the cattle population, it is of interest to note the figures given in a paper published in the same issue of *The Lancet* by Dr. Beattie, Dr. Smith and Professor Tulloch for the incidence of undulant fever in Scotland. By private investigation and through information supplied by the Scottish Department of Health, they have been able to collect records of 97 cases of undulant fever occurring since 1930, an average incidence of some 20 cases a year, a number which, for reasons given above, almost certainly underestimates the true incidence of the disease. Moreover, as the authors say, a disease can hardly be considered unimportant which gives on an average ten weeks of illness and is capable of producing an illness lasting for two years. From 1929-31 there was an increase in the number of cases reported year by year. In the years 1932, 1933 and 1934, the figures have been almost steady. The numbers reported in the various years were: 1929, 3; 1930, 10; 1931, 13; 1932, 24; 1933, 22; 1934, 24. As in other countries the disease has been found to attack males pre-

dominantly. In the present series there were 62 males (63·8 per cent.) and 35 females (36·2 per cent.). The preponderance of males would appear to be due to their engaging to a greater extent in occupations involving the handling of animals. In regard to age incidence, the authors agree with observers in other countries, that the disease affects chiefly young adults.

With regard to the route of infection, the Scottish investigators are again in agreement with the conclusions reached by numerous workers in other countries. Only 14 out of their 97 patients had any direct contact with infected animals. The remainder had probably been infected by consuming raw milk or cream. In this connection, says *The Lancet*, "though contagious abortion is known to be widely distributed among the cattle of Great Britain and though it has been shown that about 30 per cent. of samples of raw milk retailed throughout the country contain living abortus bacilli, doubt is not infrequently cast on the milk-borne origin of undulant fever in man. It is asserted that, if milk was responsible for infection, there ought to be a much closer relationship than apparently exists between the per-caput consumption of milk and the frequency of undulant fever. To those who are ignorant of the complexities of epidemiological inquiry, this argument is undoubtedly attractive, but it requires little knowledge of the distribution of human and animal disease to realise that such arguments are often fallacious. . . . .What is far more important than the quantity of the milk is the quality of the milk consumed in relation to the incidence of the disease. On this point the available figures are very suggestive, showing that in towns where most or all of the milk is pasteurised undulant fever practically does not exist."

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HERD IMMUNITY

The Lancet, in a recent issue, quotes certain of the observations of Professor Topley at this year's congress of the Royal Sanitary Institute, as indicative of some of the conclusions to which the work on herd immunity (carried out with mouse herds) is pointing.

Professor Topley suggested the following definition of herd immunity: "The immunity of any herd in relation to any infective disease may be expressed in terms of the rate of morbidity or mortality induced by the exposure of that herd to the risk of infection with the causative organism of the disease in question." Herd immunity may be of two types: (*a*) dependent upon the social or biological structure of the herd, being non-specific and due to conditions unfavourable to the transmission of infection; and (*b*) dependent upon the individual immunity (of some or all of the herd members) resulting from natural infection or from artificial immunisation. Such immunity is narrowly specific in its action. It is owing to the vulnerability to attack of the agents causing the intestinal and agent-borne infections that a herd immunity of the former type is acquired to such diseases as cholera, plague and typhus. The droplet infections, on the other hand, are limited in their spread only by the immunity which individuals have acquired by clinical or subclinical reactions to them.

In the experiments of Professor Topley and Major Greenwood (at the London School of Tropical Medicine) immunity of type (*a*) is eliminated, and the behaviour of infectious diseases is observed in a community of mice, more or less constant in population, of whom some of the initial group are deliberately infected and the casualties are replaced by susceptibles. "It has been found possible to maintain such artificial centres of disease for several years," continues *The Lancet*, "the rate of addition usually being three mice a day and the infections used are mouse typhoid, pasteurellosis—resembling pneumonic plague—and a virus disease, ectromelia. During the first few months of such an experiment there tend to be waves of mortality, but later the death-rate usually settles at a steady level if the rate of daily additions is sufficiently high. This state of affairs, artificially induced, indicates, it is suggested, that the epidemic process, when fully established under conditions which allow free spread of infection, has no inherent factor that imposes periodicity, or, indeed, any wave-like movements of mortality. The average expectation of life limited to 60 days in a healthy herd recruited at the same rate (three mice a day) is about 58 days. In herds affected with disease, new herds have about half the normal expectation, falling to about a quarter or two-fifths at the end of ten or 20 days, and then gradually improving until those that have survived for 50 days have 70 per cent., and those that have survived 100 days 80 per cent., of the normal expectation of life. The death-rate (the probability of dying within five days) rises rapidly to the 25th day of the cage-age and then tails away. It is believed that the better resistance of the surviving mice is mainly acquired by sub-lethal infection and is not genetic in origin.

"'When an infected herd is formed,' says Professor Topley, 'there is a rapid spread of infection, associated within a few weeks with a wave of mortality. The majority of the new entrants are infected soon after entry to the herd; half of them within a fortnight, 80 per cent. or more within a month. During the earlier stages of the epidemic the mice at risk are in part being killed by the prevailing disease, in part being immunised by sub-lethal infections. This early stage is marked by a widely fluctuating death-rate, or in some cases by separated waves of mortality. Later, as the total population increases, it becomes differentiated into subgroups of varying cage-age, and consequently of varying resistance. Finally, a condition of equilibrium is attained in which a steady average death-rate, derived from different death-rates operating on the different cage-age groups, combines with a steady rate of immigration to produce an invariant total population.'

"Topley and Greenwood have tried to influence this course of events by immunising mice before admission to the infected herds. In mouse typhoid the epidemic was not modified in its course, but the individual mice had a slightly improved expectation of life. With ectromelia, however, an attenuated virus had a much more striking effect. Immunised entrants artificially acquired as good a chance of survival as the old members of an infected herd and not much less than that of the normal uninfected."

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TYPES OF HIGHER NERVOUS ACTIVITY

Professor I. P. Pavlov, well-known to all veterinary students from their lectures on physiology, has recently been in London for the International Neurological Congress, at which he delivered a short paper on "the types of higher nervous activity, their relation with the neuroses and psychoses, and the physiological mechanism of

neurotic and psychotic symptoms." The paper was read in German and is summarised as follows in *The Lancet*:—

"On the basis of his experiments on conditioned reflexes, Professor Pavlov said it was possible to distinguish four types of dog. According to the strength of the excitation processes the dogs could be divided into two groups, the weak and the strong. The strong could be further subdivided according to the relationship between their excitation and inhibition processes into the balanced and the unbalanced, and finally the strong balanced type could be divided according to the liveliness and lability of the nerve processes into the slow and the quick. Thus the four types were, the strong unbridled, the strong balanced and slow, the strong balanced and quick, and the weak. These corresponded to the four Greek temperaments, the choleric, the phlegmatic, the sanguine, and the melancholic. In order to explain the normal and the pathological conduct of man it was necessary to add to these types which were common to man and animal, special human types, the artistic, the thinking, and an intermediate type. Under experimental conditions neuroses arose readily in the excitable, unbridled, and in the weak type of dog. The former lost almost entirely the capacity for inhibition; in the latter the higher nervous activity either failed entirely or remained in a chaotic state. Kretschmer, who limited himself to two general types, the unbridled and the weak, appeared to relate the former type with manic-depressive psychosis and the latter with schizophrenia.

"Professor Pavlov considered that constitutional neurasthenia was the characteristic disorder of the general weak or unbridled type and of the intermediate human type. Hysteria is the product of the general weak combined with the artistic type, and Janet's psychasthenia the product of the combination of the general weak with the thinking type. Weakness of the excitation processes led to the predominance of the inhibition processes in the form of sleep and hypnotic conditions, and a similar explanation was offered for narcolepsy, cataplexy, catalepsy, and catatonia."

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In view of the fact that several of the Council's smallholders have asked for improvements to their buildings in order to comply with the conditions laid down by the local sanitary authorities, the Montgomeryshire County Council have decided to convene a conference of county and district council officials for the purpose of ascertaining the minimum standard of construction required for the production of Grade "A" milk.

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Among the decrees adopted by the French Cabinet with a view to reducing the cost of living are the following: (1) Authorising the Prefect of each Department to fix maximum retail prices for meat with penalties for non-compliance; (2) Ordering the immediate elimination of about 150,000 head of tuberculous cattle, and (3) Building modern slaughterhouses at producing centres.

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A sheepdog saved the life of Mrs. David Thomas, a woman farmer who was being gored by a cow near Barmouth recently. She cried for help and the dog immediately darted from the farmhouse and managed to distract the cow's attention till Mr. Thomas arrived.

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Yielding to the protests of an animal protection society, the Paris police have agreed to defer their proposed gas attack on the cellars of the flats in the Rue de Lourmel, at present occupied and held against all comers by a band of some 100 savage cats, until a new form of trap has been tried.

Diseases of Animals Acts

SUMMARY OF RETURNS

Period.	Anthrax.		Foot-and-Mouth Disease.		Parasitic§ Mange.		Sheep Scab.	Swine Fever.	
	Outbreaks confirmed.	Animals attacked.	Outbreaks confirmed.	Animals slaughtered as diseased or exposed to infection.	Outbreaks reported by the Local Authorities.	Animals attacked.	Outbreaks confirmed.	Outbreaks confirmed.	Swine slaughtered.
	No.	No.	No.	No.	No.	No.	No.	No.	No.
Period 1st to 15th August, 1935	8	10	—	—	3	3	8	73	53
Corresponding period in									
1934	15	18	—	—	2	3	26	64	30
1933	11	16	2	9	—	—	13	32	28
1932	9	11	3	204	7	7	10	39	31
Total 1st January to 15th August, 1935	233	270	34	10,208	81	166	214	1,254	732
Corresponding period in									
1934	247	273	2	93	94	156	378	1,038	647
1933	184	210	58	5,359	102	178	225	970	589
1932	246	303	6	562	96	156	146	1,180	585

NOTE.—The figures for the current year are approximate only.

§ Excluding outbreaks in Army Horses.